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CONTENTS OF NO. 2

STUDIES OF PACIFIC ISLAND PLANTS, VI. NEW AND NOTEWORTHY FLOWERING PLANTS FROM FIJI. By <i>A. C. Smith</i>	137
STUDIES IN THE BORAGINACEAE, XIX. By <i>Ivan M. Johnston</i>	172
NOTEWORTHY SPECIES FROM MEXICO AND ADJACENT UNITED STATES, III. By <i>Ivan M. Johnston</i>	188
STUDIES IN THE THEACEAE, XIX. THE GENERA ARCHYTAEA AND PLOIARIUM. By <i>Clarence E. Kobuski</i>	196
THE GENUS FREYCISETIA IN FIJI. By <i>Lily M. Perry</i>	208
THE GENUS ILEX IN CHINA, IV. By <i>Shiu-ying Hu</i>	214

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JOURNAL

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STUDIES OF PACIFIC ISLAND PLANTS, VI

NEW AND NOTEWORTHY FLOWERING PLANTS FROM FIJI

A. C. SMITH

THE PURPOSE of this and some of the following studies in this series is to discuss the novelties and other unusual plants collected by the writer in 1947.¹ Following the Engler and Prantl sequence, the present paper takes up the angiosperm families from Gramineae to Leguminosae, inclusive, with the exception of certain families which need detailed study in Fiji and the adjacent archipelagos. It is hoped to present limited revisions of such families in the near future. No attempt is made in this series to list all the species collected; since the basic publication on the flora of Fiji, Seemann's *Flora Vitiensis* (1865-1873), so much material from Fiji has been assembled that a new Flora is urgently needed. Until such a work can be undertaken, it seems a matter of minor interest to list repeated collections of a species, unless thereby noteworthy distributional or morphological data can be presented.

In studying my 1947 collection I have been generously aided by the following specialists, who have undertaken identifications in their respective groups: Mr. A. H. G. Alston (*Selaginella*), Mr. E. B. Bartram (Musci), Prof. J. T. Buchholz (Coniferae), Prof. E. B. Copeland (Filicales),² Dr. C. W. Dodge (Lichenes), Dr. Francis Drouet (Algae), Dr. Margaret Fulford (Hepaticae), Dr. R. A. Howard (Icacinaceae), Dr. C. E. Kobuski (Theaceae, *Jasminum*), Prof. H. J. Lam (Sapotaceae),

¹ The collections upon which these studies will be primarily based were obtained in Fiji between April, 1947, and January, 1948, during a trip made under the auspices of the Arnold Arboretum of Harvard University and the John Simon Guggenheim Memorial Foundation. Generous financial assistance is also gratefully acknowledged from the Penrose Fund of the American Philosophical Society and the Bache Fund of the National Academy of Sciences.

² COPELAND, EDWIN B. Further Notes on the Ferns of Fiji. *Jour. Arnold Arb.* 30: 433-442. 1949.

Dr. H. N. Moldenke (Verbenaceae),³ Dr. S. J. Van Ooststroom (Convolvulaceae), Dr. L. M. Perry (Pandanaeae, Myrtaceae), Mr. Charles Schweinfurth (Orchidaceae), Dr. E. E. Sherff (*Dodonaea*, *Bidens*), Mr. V. S. Summerhayes (*Ficus*), Dr. H. K. Svenson (Cyperaceae), Mr. J. R. Swallen (Gramineae), Dr. W. L. White (Fungi), and Prof. T. G. Yuncker (*Peperomia*, *Cuscuta*).⁴ I am greatly indebted to these students for their coöperation. Thanks are also due Dr. E. D. Merrill for his assistance in certain preliminary identifications; the card-catalogue of Polynesian references compiled by Dr. Merrill, now deposited at the Arnold Arboretum, has been a source of valuable information.

ITINERARY

The part of Fiji most in need of botanical exploration, in 1947, still seemed to be the interior of Viti Levu, in spite of large collections made by Gillespie, Degener, and others during the last two decades. My principal objectives were certain isolated upland areas in western Viti Levu and the central plateau of the island.

The western half of Viti Levu and a strip along the north coast are relatively dry, characterized by grassland and thickets, interspersed with limited valley patches of forest. This type of country is locally known as the *talasinga*, in contrast to the *veikau*, or rain-forested area which covers southeastern Viti Levu. The *talasinga* of western Viti Levu is interrupted by two major mountain masses which are high enough to receive a heavy rainfall on their upper slopes. The higher of these mountain systems, the Mt. Evans Range, lies about ten miles east of Lautoka and the same distance southwest of Mba. About five weeks, in April and May, 1947, were spent in collecting on the eastern slopes of this range, with the village of Nalotawa as a base. Several trips were made up the slopes and some time was spent on the summit of the highest peak, Koroyanitu (1195 meters). The Mt. Evans Range has been occasionally visited by Mr. William Greenwood, whose collections from it proved of unusual interest, but his work was done on the western side of the range, above Lautoka, from which side Koroyanitu is practically inaccessible. A brief report on this part of my trip has been published.⁵

The second forested mountain mass arising from the *talasinga* of western Viti Levu is the range dominated by Mt. Koromba [Pickering Peak], which lies about twelve miles southeast of Nandi. For two weeks, in May and June, I collected in this area, with the village of Tumbenasolo as a base, visiting the slopes and summit of Mt. Koromba (1075 meters) and also the area to the east, in the drainage of Singatoka River tributaries.

Headquarters from the middle of June to the first part of October were

³ In *Phytologia* 3: 60. 1949, Dr. Moldenke describes a new variety of *Faradaya vitiensis* based on the present collection.

⁴ YUNCKER, T. G. Additional Notes on the Fijian Species of *Peperomia*. Jour. Arnold Arb. 30: 443-449. 1949.

⁵ SMITH, A. C. An Ascent of Koroyanitu. Proc. Nat. Acad. Sci. 34: 579-585. 1948.

made at Nandarivatu, situated on the edge of the northern escarpment of the island, about ten miles inland from the north coast. Nandarivatu until recently was the government station for the Province of Tholo North, which has now been divided among four other provinces. For years it was a popular resort for Europeans, but it is now deserted and its European-type buildings are falling into decay. Dr. J. W. Gillespie (cf. Bishop Mus. Bull. 74: 3. 1930), who spent about two months at Nandarivatu, describes it as "one of the finest locations for botanical study I have ever seen." This description is still merited, although the amenities of a government rest-house and of companionship are in the past. Mr. Otto Degener⁶ also spent some time in the vicinity of Nandarivatu in 1941. The settlement is located on the northern edge of the rain-forest which continues unbroken, for nearly 50 miles to the south and east coasts of Viti Levu.

In order not to duplicate too closely the work of Gillespie and Degener, nor of Gibbs and im Thurn, who made earlier and smaller collections in this general region, I attempted to reach areas not visited by them. Some weeks were spent on the northern portion of the Rairaimatuku Plateau, the central upland of Viti Levu which occupies an area of about 25 by 15 miles to the south of Mt. Tomanivi (Mt. Victoria, the highest peak in Fiji, with an elevation of 1323 meters). The Rairaimatuku Plateau has an average elevation of perhaps 700 or 800 meters; it is a heavily forested, rough, and often poorly drained area demarcated by eroded escarpments except on the north, where it rises into the slopes of Mt. Tomanivi. The western edge of the plateau, paralleling the Singatoka River, rather sharply marks the line between forest and grassland in this part of Viti Levu. My headquarters here was the village of Nandrau, below the western edge of the plateau, upon which trips were made to the east and south. Insufficient time was spent in this area; the more heavily forested eastern part of the plateau, in the drainage of tributaries of the Wainimala River, would repay intensive field-work.

Although other botanists have ascended Mt. Tomanivi, I did not try to resist the temptation to climb this highest Fijian peak. Two ascents were made, in July and September, by means of a southwestern spur which has served nearly every party to climb this mountain, which offers no real difficulties. The summit of Mt. Tomanivi is the type locality of several species of plants. I spent many days on various parts of the southern and western slopes of the mountain, hoping to reach areas not previously botanized.

Provincial boundaries in central Viti Levu will prove confusing to botanists who do not have available the most recent maps published by the Lands and Survey Department, Suva. A few years ago a sweeping change was made in the limits of these provinces, in order to make them conform more closely to traditional clan lines of the population. The three "hill provinces," Tholo North, Tholo East, and Tholo West, have now

⁶ DEGENER, OTTO. Naturalist's South Pacific Expedition: Fiji, 82-98. 1949.

been discontinued as administrative entities. Tholo North has been largely absorbed into the enlarged Province of Mba, which now also includes the whole of the former Provinces of Lautoka and Nandi. However, the southern part of Tholo North, together with most of Tholo West and Nandronga, now falls into the new Province of Nandronga & Navosa. The northeastern portion of Tholo North is now incorporated into the Province of Ra. A small portion of southeastern Tholo North, together with most of Tholo East, is now absorbed by the greatly enlarged Province of Naitasiri. The southern and eastern provinces, Serua, Namosi, Rewa, and Tailevu, remain essentially unchanged. Therefore Viti Levu is now divided into only eight administrative provinces rather than thirteen, as formerly. In this paper the new provincial boundaries are utilized. I also continue to use the phonetic spelling of place names which has now been adopted by the Lands and Survey Department. The use of arbitrary letters for certain sounds, as adopted locally in Fiji (cf. Degener, Naturalist's South Pacific Expedition: Fiji, 35-36. 1949), can only add confusion to scientific writings.

My last two months of field work were spent in northern Vanua Levu. This island, second in size in Fiji, is of great interest botanically, and I had desired to revisit it since my first trip there in 1933 and 1934.⁷ At that time I collected in the southern and western provinces of the island, Thakaundrove and Mbua, which are predominantly forest-covered. From October to December, 1947, I worked in the northern province, Mathuata. The northern part of Vanua Levu somewhat resembles western Viti Levu in general aspect, being *talasinga* country, but some of the hills are covered with a fairly thick forest. Two headquarters were established, the first at Lambasa, the only town of any size on Vanua Levu. The nearby hill known as Mt. Numbuiloa was collected fairly intensively; this hill (590 meters) supports a very dense forest of a comparatively dry type. In spite of its accessibility the region had not been botanized, except to a certain extent by Mr. William Greenwood, who for a time was resident in Lambasa.

Final headquarters were in the village of Natua, which lies about twelve miles inland from Nanduri, near the center of the island. This part of Vanua Levu is locally known as the Seanggangga Plateau, a slightly elevated area (100-200 meters) drained by the Korovuli River and other tributaries of the Ndreketi River. The grassland is interrupted by many small patches of dense forest which afford excellent collecting, and visits were made to the Mathuata Range, a coastal ridge which dominates north-central Vanua Levu and is well forested on its southern and upper slopes. The Mathuata coast of Vanua Levu is botanically a historical locality, as members of the U. S. Exploring Expedition and also Seemann worked along it briefly, although presumably they did not penetrate inland; it is the type locality of many species proposed by Gray, Seemann, and others.

⁷ SMITH, A. C. Plant Collecting in Fiji. Jour. N. Y. Bot. Gard. 35: 261-280. figs. 1-7. 1934.

As a result of my 1947 work, 2912 numbers, in sets of 10, were collected. The first set is deposited in the herbarium of the Arnold Arboretum (with special groups at other Harvard herbaria), and an essentially complete second set is placed in the U. S. National Herbarium. The remaining sets will be distributed from the Arnold Arboretum when identifications have been completed. It is not to be expected that a trip of this sort can succeed in filling in all the botanical "blind spots" in a rich and varied country like Fiji, although this archipelago is now better known to botanists than many of the southwestern Pacific groups. Considerable areas of forest land, including some little known mountains, remain to be botanically explored on Viti Levu and Vanua Levu, while many of the smaller islands have never been botanized.

The place of deposit of specimens cited in this paper is indicated by the usual abbreviations: Arnold Arboretum (A); Gray Herbarium (GH); New York Botanical Garden (NY); and U. S. National Herbarium (US). Mr. Swallen has kindly prepared the portion dealing with new and unusual grasses.

GRAMINEAE

by Jason R. Swallen

Ischaemum ciliare Retz. Obs. Bot. 6: 26. 1791.

VITI LEVU: Tailevu: Near Nausori, *Greenwood 1138* (GH, US) (recently seen prostrate grass in shady places); Naitasiri: Mbatiki & Government Station, *B. E. Parham 2623* (GH).

Apparently a recent introduction.

Digitaria fuscescens (Presl) Henr. in Meded. Rijks Herb. Leiden 61: 8. 1930.

VITI LEVU: Mba: Southern slopes of Mt. Ndelainathovu, on the escarpment west of Nandarivatu, alt. 870-970 m., *Smith 4953* (GH, US) (prostrate, naturalized along trail in dense forest).

Differs from *Digitaria longiflora* (Retz.) Pers. in having rather densely hairy spikelets. Not previously recorded from Fiji.

Digitaria violascens Link, Hort. Berol. 1: 229. 1827.

VANUA LEVU: Mathuata: Banks of lower Lambasa River, at sea-level, *Smith 6632* (GH, US) (along inner edge of mangrove swamp).

Specimens reported from Fiji as *Digitaria chinensis* Hornem. are probably referable to this species. The record of *D. violascens* is new to Fiji.

Brachiaria subquadriflora (Trin.) Hitchc. in Lingnan Sci. Jour. 7: 214. 1931.

VITI LEVU: Mba: Lautoka, *Greenwood 93A* (GH, US); Naitasiri: Near Nanduruloulou, *Greenwood 93B* (GH, US).

The Fijian specimens which have previously been reported as *Brachiaria distachya* (L.) Stapf are probably referable to this species. *Brachiaria distachya*, of India, differs in being a usually smaller plant, having short ovate-lanceolate blades and usually only two racemes, the peduncle being

pilose toward the summit. Some apparently intermediate plants occur, and *B. subquadriflora* may be only a variety of *B. distachya*.

Brachiaria erucaeformis (Smith) Griseb. in Ledeb. Fl. Ross. 4: 469. 1853.

VITI LEVU: Mba: Lautoka, near sea-level, *Greenwood 1194* (GH, US) (on edge of drain).

The first record of this species from Fiji.

Isachne dispar Trin. Gram. Icon. 1: 8. pl. 86. 1827.

VITI LEVU: Mba: Nandarivatu, alt. 800 m., *Greenwood 1178* (GH, US) (in open sunny swampy ground near creek).

This specimen represents a second species of *Isachne* in Fiji. It compares very well with specimens cited in Hooker's Flora of British India, but in leaf characters it does not compare well with Trinius' plate. Since the spikelets are in rather poor condition and the range extension is so great, the record should be considered doubtful until more adequate material is available.

Eragrostis scabriflora Swallen in Jour. Wash. Acad. Sci. 26: 179. 1936.

VITI LEVU: Nandronga & Navosa: Southern slopes of Nausori Highlands, above Tumbenasolo, alt. 360 m., *Greenwood 1190* (GH, US) (on dry open ridges). KANDAVU: Between Richmond and Naloto, *B. E. Parham 3001* (GH, US).

The first specimen cited differs from the type in having longer, spreading panicle branches. The species was described from the island of Aiwa, southeast of Lakemba, in the central Lau Group of Fiji.

Garnotia foliosa Swallen, sp. nov.

Perennis; culmi dense caespitosi, erecti, 48–85 cm. alti, glabri, nodis appresso-pilosis; vaginae plus minusve carinatae, glabrae vel sparse papilloso-pilosae, collo densissime pilosae, inferiores internodiis longiores, superiores internodiis multo breviores; ligula membranacea, minute ciliata, 0.5 mm. longa; laminae 5–13 cm. longae, 6–10 mm. latae, erectae, acuminatae, planae, supra papilloso-pilosae vel subglabrae, marginibus scabrae, infra purpureae; paniculae 6–10 cm. longae, erectae, ramis paucis appressis; spiculae breviter pedicellatae, appressae, callo brevissime barbatae; glumae nervis scabrae, aristatae, arista 1.5–3 mm. longa scabra, prima 3.5 mm. longa, secunda 4.3 mm. longa; lemma 3.5 mm. longum, glabrum, arista scabra 6–7.5 mm. longa; palea lemmate ca. 1/3 brevior.

VANUA LEVU: Mathuata: Summit ridge of Mt. Numbuiloa, east of Lambasa, alt. 500–590 m., Nov. 6, 1947, *Smith 6520* (GH, US TYPE) (in dense crest forest).

The broad, purplish, erect blades and narrow, long-exserted panicles give this species a very distinctive appearance.

Garnotia gracilis Swallen, sp. nov.

Perennis; culmi gracillimi, ramosissimi, erecti vel adscendentes, glabri, 18–36 cm. alti; vaginae internodiis longiores, sparse papilloso-pilosae

pilis longis; ligula membranacea, ca. 0.3 mm. longa; laminae 3–6 cm. longae, 1.5–2.5 mm. latae, planae, acuminatae, tenues, rigide divergentes vel reflexae, glabrae vel sparse pilosae; paniculae longe exsertae, 3–8 cm. longae, ramis brevibus, appressis, paucifloris; spiculae callo brevissime barbatae; glumae nervis scabrae, acuminatae vel brevissime aristatae, secunda 4.5 mm. longa, prima paulo brevior; lemma 4 mm. longum, glabrum, arista scabra 5–8.5 mm. longa; palea angusta lemma aequans.

VITI LEVU: Mba: Slopes of Mt. Nairosa, eastern flank of Mt. Evans Range, alt. 700–1050 m., May 14, 1947, *Smith 4413* (GH, US TYPE) (in dense mats on open summit); northern portion of Mt. Evans Range, between Mt. Vatuyanitu and Mt. Natondra, alt. 700–900 m., *Smith 4338* (GH, US).

The very slender branching culms, relatively short, stiffly spreading or reflexed blades, and narrow, few-flowered panicles are characteristic.

***Garnotia divergens* Swallen, sp. nov.**

Perennis; culmi graciles, ramosissimi, glabri, 35–40 cm. alti; vaginae internodiis longiores, glabrae, in ore et collo longe pilosae; ligula membranacea, 1 mm. longa; laminae usque ad 12 cm. longae, 2.5 mm. latae, attenuatae, glabrae, adscendentes, planae vel subconvolutae, plus minusve curvatae; paniculae 4–8 cm. longae, longe exsertae, ramis solitariis vel binis, rigide divergentibus, inferioribus usque ad 3 cm. longis; spiculae 3 mm. longae, callo glabrae; glumae acutae, aequales; lemma glumam aequans, arista 1–3 mm. longa.

VANUA LEVU: Mathuata: Summit ridge of Mt. Numbuiloa, east of Lambasa, alt. 500–590 m., Nov. 6, 1947, *Smith 6519* (GH, US TYPE) (in dense mats in dense forest).

This species resembles the preceding in having branching culms, but the blades are erect or ascending, usually convolute, and the panicle branches are much longer and stiffly spreading.

***Garnotia villosa* Swallen, sp. nov.**

Perennis; culmi adscendentes, circiter 50 cm. alti, multinodosi; vaginae internodiis multo longiores, summo dense villosae; ligula brevissima; laminae 12.5–16 cm. longae, usque ad 10 mm. latae, planae, subattenuatae, marginibus basi ciliatae; paniculae 16–20 cm. longae, laxae, ramis gracilibus, verticillatis, inferioribus usque ad 7 cm. longis; spiculae 3.5–4 mm. longae, paulo distantes, breviter vel longe pedicellatae, callo sparse et breviter barbatae; glumae acuminatae secunda quam prima paulo longior; lemma glabrum, acuminatum vel breviter aristatum.

VITI LEVU: Namosi: Mt. Korombasambasanga, *B. E. Parham 2162* (GH TYPE).

In spikelet characters this species is similar to *Garnotia stricta* Brongn., but the numerous, overlapping, villous sheaths, the broad blades, and the lax panicles readily distinguish it.

***Garnotia linearis* Swallen sp. nov.**

Perennis; culmi 38–±60 cm. alti, erecti vel adscendentes, nodis inferioribus radicanes, glabri; vaginae carinatae, internodiis longiores, summo

longe pilosae, collo dense villosae; ligula membranacea, eroso-ciliata, 0.5 mm. longa; laminae 6–14 cm. longae, 3–4 mm. latae, planae, attenuatae, glabrae, basi longe pilosae; paniculae circiter 18 cm. longae, angustae, ramis solitariis, distantibus, appressis, inferioribus usque ad 4.5 cm. longis; spiculae breviter pedicellatae, callo glabrae vel breviter barbatae; glumae subaequales vel secunda paulo longior, acuminatae, secunda arista gracili 1–6 mm. longa praedita; lemma 3.5 mm. longum, glabrum, acuminatum, arista gracillima, flexuosa, 8–10 mm. longa; palea angusta, lemma subaequans.

KANDAVU: Near Ndaku Village, *B. E. Parham* 2964 (GH TYPE).

This species differs from all the others described above in the long linear blades, and in the long, very slender flexuous awn of the lemma.

The only species of *Garnotia* reported from the Fiji Islands is *G. stricta* Brongn., described from Tahiti. No specimens have been seen which agree with the original description and the excellent accompanying illustration. Since the species of *Garnotia* are apparently localized and limited in distribution, it seems very unlikely that *G. stricta* occurs in Fiji. The species described above are very distinct from each other, and have characters very different from those of *G. stricta*.

Leptaspis angustifolia Summerh. & C. E. Hubb. in *Kew Bull.* 1927: 40, 78. 1927.

VANUA LEVU: Mathuata: Southern slopes of Mt. Numbuiloa, east of Lambasa, alt. 350–500 m., *Smith* 6583 (GH, US) (on steep rocky slope in open forest); Mbambuambua or Nasuvu Hill, near Lambasa, *Fil. Raiqiso* 1506 (GH); near Lambasa, *B. E. Parham* 2413 (GH).

The species was described from near Lambasa and is apparently restricted to this region.

Erianthus maximus Brongn. in *Duperrey, Bot. Voy. Coquille* 2(2): 97. 1831.

VITI LEVU: Mba: Vicinity of Nalotowa, eastern base of Mt. Evans Range, alt. 550–600 m., *Smith* 4309 (GH, US).

The specimen is a cultivated form, locally called “Ndule,” in which the inflorescence remains undeveloped. It is commonly boiled and eaten by the natives. Grassl (in *Jour. Arnold Arb.* 27: 247. 1946) refers to it as “hort. var. Abortive,” considering it to be of different origin than *Saccharum edule* Hassk., which is similarly used in New Guinea. Specimens of these abortive forms are rare in herbaria, the one cited being the only one in the U. S. National Herbarium.

PALMAE

Calamus vitiensis Warb. ex Becc. in *Ann. Bot. Gard. Calcutta* 11: 350. pl. 143. 1908.

VITI LEVU: Naitasiri: Navuakethe, Nanduna, *B. E. Parham* 5642 (A).

The cited specimen, although consisting only of the middle portion of a leaf with four complete leaflets, so precisely agrees with Beccari's description and plate that one can refer it to *C. vitiensis* with confidence. The collection, in spite of its incomplete nature, is of great interest as apparently being the only specimen known other than the type, *Weber 111*, from Taveuni, deposited in the Berlin herbarium and presumably destroyed.

***Vitiphoenix pedionoma* sp. nov.**

Palma ad 10 m. alta, caudice circiter 20 cm. diametro, frondis vagina cylindrica ampla; petiolis rhachibusque primo inconspicue pallido-leprosis mox glabris, frondibus circiter 4 m. longis superne cernuis, segmentis inferioribus 6–10 cm. inter se distantibus, superioribus densius dispositis; petiolo 40–60 cm. longo, rhachi robusta, ad 2 cm. lata utrinque rotundata marginibus subacuta; frondis segmentis utrinsecus circiter 50 apicalibus exceptis subsimilibus lanceolatis, 55–75 cm. longis, 4–5.5 cm. latis, subrigidis, inferne gradatim angustatis, basi curvatis, superne attenuatis, apice bifidis vel irregulariter fissis plus minusve destructis, subtus basim versus paleis anguste linearibus tortis ad 1 cm. longis sparsim praeditis, nervis marginalibus validis, segmentis superioribus longitudine et latitudine decrescentibus, apicalibus circiter 20 cm. longis; spadice 3- vel 4-plo ramoso circiter 60 cm. longo et lato haud pedunculato, rhachi ramis ramulisque glabris inferne valde angulosis, ramis primariis numerosis conspicue (ad 10 cm.) pedunculatis, ramulis copiosis, floriferis 12–16 cm. longis in internodiis dimidia parte circiter 2 mm. diametro ad apicem glomerulis in spira laxa dispositis; florum glomerulis 3-floris, flore femineo intermedio bracteis surgentibus conspicuis circiter 1 mm. altis persistentibus circumdato; floribus masculis anguste ellipsoideis 7–8 mm. longis, calyce circiter 2.5 mm. diametro, sepalis late rotundatis $1.5-2 \times 2.5-3.5$ mm., petalis oblongis circiter $6.5 \times 2.5-3$ mm. apice obtusis, staminibus 30–35, filamentis filiformibus 1.5–2 mm. longis, antheris linearibus 3.5–4.5 mm. longis basi sagittatis apice incis, connectivo in sicco fusco-castaneo, pistillodio filiformi quam staminibus paullo longiore; floribus femineis triquetris-subglobosis sub anthesi 3–3.5 mm. diametro, sepalis late rotundatis $1.5-2 \times 2.5-3.5$ mm., petalis triangulari-ovatis circiter 2 mm. longis apice subacutis valvatis, gynaecio ovoideo stigmatibus 3 triangularibus; fructu maturo ellipsoideo rubro cum perianthio in sicco circiter 15 mm. longo et 7 mm. lato, apice breviter rostrato, extus sclerosomatibus densissime lineolato, pericarpio tenui haud 0.3 mm. crasso, semine utrinque rotundato; perianthio fructifero cupuliformi 4–5 mm. alto et 5–6 mm. diametro, sepalis rotundatis, petalis apice breviter triangularibus.

VANUA LEVU: Mathuata: Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, alt. 100–200 m., Nov. 25, 1947, *Smith 6635* (A TYPE, US) ("niuniu"; palm in patches of forest in open rolling country; caudex to 10 m. high and about 20 cm. in diameter; fronds in a dense crown, about 4 m. long, the base expanded into a long sheath surrounding the trunk, the petiole 40–60 cm. long, the pinnae about 50 pairs, crowded distally; inflorescences several below leaves, freely branched, each

forming a mass about 60 cm. in diameter; perianth and stamens white, the fruit at length red; leaves used for thatching; wood used for canoe-ribs, etc.).

Of the two described species of Burret's subgenus *Acmophoenix*, like which it has conspicuous broad bracts subtending the pistillate flowers, *V. pedionoma* is more closely allied to *V. petiolata* Burret. It differs, however, in its larger and longer-petiolate fronds with more numerous and broader segments, which are irregularly and more deeply split distally, in its larger and more copiously divided spadix, in its proportionately narrower staminate flowers and fewer stamens, and in its shorter and proportionately broader fruit. From the other known species of the subgenus *Acmophoenix*, *V. sessilifolia* Burret, the new species differs in obvious proportions of its fronds and in its more robust inflorescence-parts.

Balaka leprosa sp. nov.

Palma 3–7 m. alta, caudice 2–5 cm. diametro; frondibus 1–2 m. longis, vagina ut petiolis rhachibusque copiose et subpersister leprosis, squamulis teneris circiter 1 mm. diametro, centro badiis, margine ramulis gracilibus albidis numerosis ornatis; vagina cylindrica robusta ad 5 cm. lata apice contracta; petiolo subnullo 6–10 mm. diametro segmentos 1–3 valde reductos utrinsecus margine gerente; frondis segmentis (basalibus minutis exceptis) utrinsecus 11–13 regulariter dispositis; segmentis mediis ad 15 cm. longis et 10 cm. latis, nervis 3 utrinque prominentibus, apice oblique praemorsis, basi valde contractis; segmentis apicalibus suboppositis oblique truncato-praemorsis apice 9–20 cm. latis, basi contractis rhachi 2.5–8 cm. adnatis; spadice fructifero pedunculo incluso ad 40 cm. longo duplicato-ramoso, ramis angularibus fusco-furfuraceis, primariis 3–7 fructiferis 10–18 cm. longis; pedunculo sub fructu (4–)8–13 cm. longo gracili 6–8 mm. lato basi amplexente ad 4 cm. lato medium versus spatharum cicatricibus 2 vel 3 ornato, spathis ad 22 cm. longis et 3 cm. latis deciduis; glomerulis distichis demum 4–6 mm. distantibus, 3-floris, flore intermedio femineo, glomerulis apicem versus plerumque 1-floris masculis; floribus masculis circiter 5 mm. longis, sepalis ovatis late imbricatis circiter 1.5 × 2 mm. apice rotundatis margine inconspicue ciliatis, petalis valvatis oblongis circiter 4.5 × 2 mm. striatis apice obtusis, staminibus inclusis circiter 25, filamentis gracilibus circiter 1 mm. longis, antheris 2.5–3.5 mm. longis basi sagittatis, connectivo in sicco rubro, pistillodio petalos subaequante; floribus femineis triquetro-subglobosis sub anthesi ad 6 mm. diametro, sepalis late convolutivo-imbricatis circiter 5 mm. longis et 10 mm. latis apice rotundatis extus inconspicue leprosis, petalis sepalis subsimilibus apice valvato obtusis margine scariosis ciliatis, gynaeceo sub anthesi ad 5 mm. longo; perianthio fructifero cupuliformi ad 15 mm. alto et 20 mm. diametro, sepalis rotundatis parvis, petalis imbricatis valde striatis apice breviter mucronatis; fructu maturo aurantiaco oblongo-ovoideo, in vivo tereti ad 4 cm. longo et 1.7 cm. lato, in sicco obtuse angulari, basi obtuso, apice in rostrum gradatim contracto; epicarpio tenui sclerosomatibus densis lineolatis ornato; endocarpio lignoso ad 40 mm. longo et 13 mm. lato 4-angulari, angulis 3 valde prominentibus apice ad

2 mm. productis, inter angulos inconspicue oblique costato, in rostrum angustum 12–14 mm. longum subito contracto; semine maturo 4-angulati, 21–24 mm. longo, circiter 7 mm. diametro, basi rotundato, apice in rostrum plus minusve conspicuum ad 6 mm. longum producto.

VITI LEVU: Mba: Hills east of Nandala Creek, about 3 miles south of Nandarivatu, alt. 850–970 m., Sept. 25, 1947, *Smith 6219* (A TYPE, US) ("mbalaka"; slender palms 3–5 m. high, in dense forest; caudex straight, 3–5 cm. in diameter; fronds in a crown at apex, usually 1–1.5 m. long; inflorescence lateral below leaves, up to 40 cm. long with 3–7 lateral branches; perianth green; stamens white; mature fruit bright orange, about 3–4 cm. long); Vuninatambua, Navai, alt. about 900 m., *Degener 14764* (A, US) ("mbalaka"; palm about 7 m. high, in dark forest; fronds to 2 m. long; fruit bright orange-red, succulent, the kernel edible; ceremonial spears made from caudex).

The new species is characterized by its essentially sessile fronds, the copious scurfy indument of the leaf-rachis and inflorescence-branches, and its large fruits. In the last character it suggests *B. macrocarpa* Burret, from which it differs not only in its insignificant petioles and more copious indument, but also in its much shorter and broader leaf-segments. *Balaka longirostris* Becc. is another large-fruited Fijian species, described from fruits alone; in comparison with this species, *B. leprosa* has the endocarp longer, narrower, and with the three sharp angles distally produced into acute appendages rather than distally obtuse.

Goniocladus petiolatus Burret in Notizbl. Bot. Gart. Berlin 15: 87. 1940.

VITI LEVU: Ra: Ridge from Mt. Namama (east of Nandarivatu) toward Mt. Tomanivi [Mt. Victoria], alt. 1050–1120 m., *Smith 5700* (A, US) (palm 8 m. high, in dense forest; trunk slender, about 10 cm. in diameter near base, slightly narrowed distally; fronds about 1.5 m. long, the stipe about 15 cm. long, expanded into a broad sheathing base up to 30 cm. long surrounding apex of trunk, the pinnae 25–30 pairs; inflorescences clustered below fronds, about 25 cm. long, with 8–10 lateral branches); Mba: Vuninatambua, Navai, alt. about 900 m., *Degener 14792* (A, US) ("tangandanu"; in forest; trunk about 2 m. high, the fronds up to 2 m. long; entire inflorescence purple-brown); Nandronga & Navosa: Vicinity of Nandrau, alt. about 600 m., *Degener 14893* (A) ("tangandanu"; juvenile palm, in forest).

The cited specimens agree very closely with Burret's detailed description of the only species of his new genus. The plant is otherwise known from the type, collected on the southern part of the central plateau of Viti Levu. The collections cited above are from the northern extension of the same mountain-complex.

ZINGIBERACEAE

Alpinia Hemsleyana K. Schum. in Pflanzenr. 20[IV. 46]: 348. 1904.

VITI LEVU: Mba: Slopes of Mt. Nairoso, eastern flank of Mt. Evans Range, alt. 700–1050 m., *Smith 4087* (A, US) (coarse herb to 3 m. high, in dense forest; leaves 1–1.5 m. long; inflorescence terminal, nodding, 50–60 cm. long; corolla at length dull orange); Naitasiri: Waindina River

basin, alt. 75 m., *MacDaniels 1058* (GH) ("vava"; perennial herb 4 m. high, in rain-forest; rachis 60 cm. long, the peduncle about 40 cm. long).

The species has otherwise been recorded only from the type specimen, *Horne 593*, from the island of Rambi.

Alpinia macrocephala K. Schum. in *Pflanzenr.* 20[IV. 46]: 350. 1904.

VITI LEVU: Mba: Hills between Nggaliwana and Tumbeindreketi Creeks, east of the sawmill at Navai, alt. 725–800 m., *Smith 5873* (A, US) ("mboia"; coarse simple-stemmed herb up to 6 m. high, in dense forest; leaves alternating on distal part of stem, about 1.5 m. long; inflorescence apical, composed of a compact subspherical mass of flowers about 20 cm. in diameter, the outer bracts oblong, about 15 × 8 cm.; calyx white with brown sericeous pubescence; corolla, filaments, and style white; fruit green, about 3 × 2 cm.). OVALAU: *U. S. Expl. Exped.* (GH).

The species has previously been recorded only from the type, a Horne specimen without definite locality. It is a striking and highly characteristic plant, being the only Fijian member of the small section *Amomiceps* K. Schum.

PIPERACEAE

Piper crispatum A. C. Sm. in *Jour. Arnold Arb.* 24: 354. 1943, 27: 319. 1946.

VITI LEVU: Mba: Summit of Mt. Koroyanitu, high point of Mt. Evans Range, alt. 1165–1195 m., *Smith 4196* (A, US) (liana; abundant but uncommonly flowering; spikes ivory-white; also occurring on upper slopes).

The cited collection is the third of the species known to me. The type lacked locality data, but Mr. Greenwood has also obtained a specimen from the Mt. Evans Range. The present collection, like the type, bears pistillate spikes, and offers no essential points of difference.

Piper stipulare A. C. Sm. in *Jour. Arnold Arb.* 24: 354. 1943.

VITI LEVU: Mba: Western and southern slopes of Mt. Tomanivi [Mt. Victoria], alt. 850–1150 m., *Smith 5245* (A, US) ("wa ndai"; liana, in dense forest; fruiting spikes up to 12 mm. in diameter).

The three previously known collections of this species have also come from Viti Levu, two of them from lower elevations in the southeastern part of the island and the third without definite locality. The new collection differs slightly in having its leaf-blades shallowly cordate at base rather than obtuse or rounded, while the principal nerves are not quite so highly concurrent, sometimes diverging essentially from the base of the blade. The fruiting spikes are 5–7 cm. long excluding the peduncle, which is 14–17 mm. long. The fruits are obovoid, semi-immersed in the rachis, and 2–3 mm. in apical diameter.

Piper oxycarpum C. DC. in *Jour. Linn. Soc. Bot.* 39: 164. 1909; A. C. Sm. in *Jour. Arnold Arb.* 24: 355. 1943.

VITI LEVU: Mba: Northern slopes of Mt. Namendre, east of Mt. Koromba [Pickering Peak], alt. 750–900 m., *Smith 4552* (A, US).

The previously known representatives of this well marked species have

been obtained, as far as locality-data are available, near Nandarivatu, in the old Province of Tholo North. My locality cited above is in the old Province of Nandi, now incorporated into Mba. Although it is sterile, no. 4552 clearly represents *P. oxycarpum*; its petioles are sometimes as long as 5 cm. and its leaf-blades up to 20×15 cm. and obviously cordate at base.

BALANOPSIDACEAE

Balanops vitiensis (A. C. Sm.) Hjelmqvist in Bot. Notiser Suppl. 2: 64. fig. 24, G-K, 25, e. 1948.

Trilocularia vitiensis A. C. Sm. in Sargentia 1: 11. fig. 2. 1942.

VITI LEVU: Without locality, *B. E. Parham* 858 (A); Mba: Hills between Nandala and Nukunuku Creeks, alt. 750–850 m., *Smith* 6180 (A, US); hills between Nggaliwana and Nandala Creeks, south of Nauwanga, alt. 725–850 m., *Smith* 5853 (A, US) (“mataumasima”); hills between Nggaliwana and Tumbeindreketi Creeks, east of the sawmill at Navai, alt. 725–800 m., *Smith* 5986 (A, US); summit of Mt. Tomanivi [Mt. Victoria], alt. 1290–1323 m., *Smith* 5194 (A, US); Ra: Ridge from Mt. Namama toward Mt. Tomanivi, alt. 1050–1120 m., *Smith* 5699 (A, US); Nandronga & Navosa: Northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, alt. 725–825 m., *Smith* 5404 (A, US) (“wailanga”); Serua: Uluvatu, vicinity of Mbelo, near Vatukarasa, *Tabualewa* 15630 (A, US); Mburetolu Mt., Taunovo, *B. E. Parham* 2859 (A). VANUA LEVU: Mathuata: Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, alt. 100–200 m., *Smith* 6693 (A, US); summit ridge of Mt. Numbuiloa, east of Lambasa, alt. 500–590 m., *Smith* 6461 (A, US).

The suggestion that *Trilocularia* be reduced to *Balanops*, made in Hjelmqvist’s very informative paper on the floral morphology and phylogeny of the Amentiferae (op. cit. 68), is herewith adopted. The diagnostic character separating the two genera, whether the gynaecium is dimerous or trimerous, is seen to be invalid in *B. vitiensis*, as pointed out by Hjelmqvist.

The eleven collections cited above represent a species heretofore considered rare, known only from the four Degener specimens which I cited in 1942; it is curious that this plant should now appear to be a fairly frequent element of the vegetation in parts of Fiji. It is usually found in dry semi-open forest or in the forest-grassland transitional belt, but I have also noted it in fairly dense wet forest on Viti Levu, and the habitat noted on Mt. Tomanivi was dense mossy forest. If all the specimens here cited are correctly placed in one species, its altitudinal range is remarkable; but morphological variations of some degree should also be noted.

Smith 5194, the specimen from Tomanivi, differs in appearance from typical material of the species, having comparatively small leaves (petioles 2–4 mm. long; blades $3\text{--}5.5 \times 1.5\text{--}2.5$ cm.); its ♂ inflorescences are very slender, 1–2 cm. long, and with the lower flowers obviously pedicellate (pedicels 2.5–4 mm. long) rather than sessile as in the type of the species. Whether these differences are of consequence or due merely to

the exposed position of the individual on a high ridge is open to question.

Parham 858 is a very robust specimen, with leaf-blades up to 16×6 cm. and obviously undulate at margin; its δ inflorescences are often 3 cm. long and the lower flowers have pedicels 3–5 mm. long. This specimen has its flower-subtending bracts lanceolate and 2–2.5 mm. long.

The remaining specimens cited show all gradations in foliage between the extremes, the largest available leaves occurring on *Smith 5986* (petioles up to 15 mm. long; blades up to 17×9 cm.). The type of the species and the other three specimens cited by me in 1942 are approximately average in foliage.

Among the available fruiting specimens there is also a high degree of variation. The pedicel may be up to 18 mm. long (*Smith 6693*). The mature fruits of *Smith 6180* and *6461* are quite similar to those described in 1942, but no. *6693* has longer and proportionately narrower mature fruits (up to 20×10 mm.).

These notes indicate so much variation among the known Fijian specimens of *Balanops* that the advisability of further nomenclatural division is to be considered. At least such an extreme form as the Tomanivi specimen should probably not be left in *B. vitiensis*. For the time being, however, I am unable to designate satisfactory lines for further division of the population.

ULMACEAE

Celtis Harperi Horne ex Baker in Jour. Linn. Soc. Bot. 20: 371. 1883;
A. C. Sm. in Bull. Torrey Club 70: 535. 1943.

VITI LEVU: Mba: Upper slopes of Mt. Koromba [Pickering Peak], alt. 800–1075 m., *Smith 4637* (A, US) (slender tree 6 m. high, in forest on ridges and spurs); Naitasiri: Tholo-i-suva, alt. about 150 m., *V. C. Raiqiso 460* (A) (small tree, in forest; "mala-ni-via").

The cited specimens are the first of this species definitely known from Viti Levu, the type and the other specimens cited by me in 1943 having been collected on Vanua Levu.

Celtis vitiensis A. C. Sm. in Bull. Torrey Club 70: 536. 1943.

VITI LEVU: Mba: Western and southern slopes of Mt. Tomanivi [Mt. Victoria], alt. 850–1150 m., *Smith 5281* (A, US) ("tandili"; tree 25 m. high, in dense forest; flowers greenish white).

This species appears to be local in the uplands of Viti Levu, on the basis of material thus far known; three specimens were originally cited. *Degener 14897* was obtained at Nandrau, which is now in the Province of Nandronga & Navosa; the other specimens cited in 1943 are in the Province of Mba, the old Province of Tholo North having been divided.

URTICACEAE

Elatostema fruticosum Gibbs in Jour. Linn. Soc. Bot. 39: 171. *pl. 16*. 1909; A. C. Sm. in Sargentia 1: 19. 1942.

VITI LEVU: Mba: Slopes of Mt. Nairoso, eastern flank of Mt. Evans

Range, alt. 700–1050 m., *Smith 4099* (A, US); immediate vicinity of Nandarivatu, alt. 800–900 m., *Smith 5034* (A, US); western slopes of Mt. Nanggaranambuluta [Lomalangi], east of Nandarivatu, alt. 850–1000 m., *Smith 4764* (A, US); hills between Nggalawana and Tumbeindreketi Creeks, east of the sawmill at Navai, alt. 725–800 m., *Smith 5976* (A, US); western and southern slopes of Mt. Tomanivi [Mt. Victoria], alt. 850–1150 m., *Smith 5092* (A, US); Nandronga & Navosa: Northern portion of Rairaimatuku Plateau, between Nandrau and Nanga, alt. 725–825 m., *Smith 5513* (A, US), between Nandrau and Rewasau, alt. 725–825 m., *Smith 5598* (A, US).

This species has previously been known with certainty from three collections, all from the vicinity of Nandarivatu; it is one of the characteristic and abundant components of the undergrowth in the dense wet forest of montane Viti Levu, but it has not yet been obtained on other islands. Usually *E. fruticosum* is a freely branching coarse herb (suffrutescent at base) or succulent shrub 1–4 m. in height. Fijian names are *mbeta* (more or less generic) or *ndraindraia* (more commonly used for *E. australe* (Wedd.) Hall. f.). Some of the present specimens have the leaf-blades up to 21×8.5 cm.

Elatostema Greenwoodii A. C. Sm. in Jour. Arnold Arb. 27: 319. 1946.

VITI LEVU: Mba: Eastern slopes of Mt. Koroyanitu, Mt. Evans Range, alt. 950–1050 m., *Smith 4143* (A, US) (abundant shrub 2–3 m. high, in dense low forest).

The cited specimen, from essentially the type locality, resembles the type very closely but is slightly more robust. Its petioles are up to 4 mm. or rarely 5 mm. in length, and the largest leaf-blades observed are about 12.5×3.5 cm.

Elatostema palustre A. C. Sm. in Sargentia 1: 20. 1942.

VITI LEVU: Naitasiri: Northern portion of Rairaimatuku Plateau, between Mt. Tomanivi [Mt. Victoria] and Nasonggo, alt. 870–970 m., *Smith 5769* (A, US) (simple-stemmed succulent herb 30–80 cm. high, rarely branched, in dense forest; heads 1–1.5 cm. in diameter; perianth-segments and filaments translucent, the stamens white).

The second collection of this distinctive species agrees in essential details with the type, which was collected on the southern portion of the Rairaimatuku Plateau; the type-locality, cited as being in the province of Tholo East, by a realignment of provincial boundaries now falls approximately on the boundary between Naitasiri and Nandronga & Navosa. From the type, my collection differs chiefly in its glabrous foliage (with a few scattered hairs similar to those of the type), and in having its peduncles up to 35 mm. in length, with the receptacle up to 15 mm. in diameter. The prominent stipules which characterize the species were erroneously described in 1942 as being 1.5–2 “mm.” long; this figure, of course, should have been 1.5–2 cm.

Elatostema tenellum A. C. Sm. in Sargentia 1: 22. 1942.

VITI LEVU: Mba: Hills east of Nandala Creek, about 3 miles south of

Nandarivatu, alt. 850–970 m., *Smith 6231* (A, US) (on wet banks along stream in dense forest; bracts dull pink); summit of Mt. Tomanivi [Mt. Victoria], alt. 1290–1323 m., *Smith 5196* (A, US) (sprawling repent herb, in a dense colony in dense mossy forest); Ra: Ridge from Mt. Namama (east of Nandarivatu) toward Mt. Tomanivi, alt. 1050–1120 m., *Smith 5686* (A, US) (succulent herb, in dense forest).

The three cited specimens precisely match the type of this species; it has previously been known from two collections, the type (from Vanua Levu) and a specimen from Namosi Province on Viti Levu.

Two collections which weaken the specific lines between *E. tenellum* and *E. eximium* A. C. Sm. were made on Viti Levu in 1947. The first of these, *Smith 4873* (A, US) (from the summit of Mt. Nanggaranambuluta [Lomalangi], east of Nandarivatu, Mba, alt. 1100–1120 m., in dense forest) was taken from a dense colony in which the majority of the individual plants precisely agreed with *E. tenellum*. However, the colony included some plants with leaves approaching in size those of *E. eximium*, and a few plants intermediate in size were observed and collected. A second puzzling collection is *Smith 5728* (A, US) (from the same locality as no. 5686, cited above). In general the individuals of this dense colony agreed excellently with *E. eximium*, but other plants had foliage tending toward that of *E. tenellum* in size. At the time of their description, *E. tenellum* and *E. eximium* seemed entirely distinct, but the existence of the colonies here discussed can lead one to conclude either that (1) the two species hybridize at least on the ridges east of Nandarivatu, or (2) only one species, with tremendous foliar variability, should be recognized for the plants of this immediate affinity.

Elatostema (§*Euelatostema*) *epallocaulum* sp. nov.

Herba epiphytica, caule arborum truncis appresso glabro pauciramoso cystolithis minutis confertissime lineolato; foliis alternatis, petiolis gracilibus 1–2 mm. longis, laminis in sicco papyraceis fusco-viridibus lanceolatis, 5–7.5 cm. longis, 1.2–2 cm. latis, basi inaequilateraliter attenuatis (basi ipsa minute rotundata haud auriculata), apice gradatim attenuatis, margine dentibus subacutis circiter 1 per centimetrum grosse serratis, utrinque cystolithis 3–5-partitis circiter 0.15 mm. diametro paullo elevatis manifeste ornatis, utrinque glabris vel supra pilis paucis rigidis subappressis circiter 1 mm. longis inconspicue strigosis, pinnatinerviis, costa utrinque paullo elevata, nervis lateralibus utrinsecus 3–5 brevibus subobscuris; stipulis membranaceis lanceolatis, 10–14 mm. longis, 2–3 mm. latis, glanduloso-lineolatis, mox caducis; receptaculis ♂ solis visis breviter (1–1.5 mm.) pedicellatis calcaribus exceptis 7–8 mm. latis (calcaribus inclusis ad 24 mm. latis), bracteis exterioribus 6 late suborbicularibus glabris, liberis, extus cystolithis minutis copiose ornatis, 2 maximis circiter 6 × 9 mm. apicem versus calcar gracili recto 8–9 mm. longo conspicue corniculatis, bracteis lateralibus circiter 4 × 6 mm. calcar ad 3 mm. longum gerentibus; bracteolis membranaceis oblongo-obovatis 4–4.5 mm. longis 1–2 mm. latis breviter glanduloso-lineolatis; floribus paucis, pedicellis tenuibus ad 2 mm.

longis, perianthii segmentis 4 circiter 1.5 mm. longis apicem versus minutissime corniculatis, filamentis 1.5–2 mm. longis, antheris circiter 1.5 mm. longis.

VITI LEVU: Ra : Ridge from Mt. Namama (east of Nandarivatu) toward Mt. Tomanivi [Mt. Victoria], alt. 1050–1120 m., Aug. 18, 1947, *Smith 5692* (A TYPE, US) (epiphyte in dense forest, the stems appressed to tree-trunks; perianth and anthers white).

The new species is marked by its climbing habit (whence the specific epithet) and the conspicuous lateral spurs of its staminate receptacles, characters which differentiate it from *E. humile* A. C. Sm., to which it seems most closely allied. It is further distinguished by its more coarsely serrate leaf-blades, smaller foliar cystoliths, and less obvious venation.

Procis Archboldiana A. C. Sm. in *Sargentia* 1: 25. 1942.

VITI LEVU: Mba : Hills between Nandala and Nukunuku Creeks, alt. 750–850 m., *Smith 6182* (A, US); western slopes and summit of Mt. Nanggaranambuluta [Lomalangi], east of Nandarivatu, alt. 1000–1120 m., *Smith 4819* (A), *4863* (A, US); hills between Nggalawana and Tumbeindreketi Creeks, east of the sawmill at Navai, alt. 725–800 m., *Smith 5984* (A, US), *5987* (A, US); upper western slopes of Mt. Tomanivi [Mt. Victoria], alt. 1250 m., *Smith 5206* (A, US); Naitasiri: Northern portion of Rairaimatuku Plateau, between Mt. Tomanivi and Nasonggo, alt. 870–970 m., *Smith 5758* (A, US).

This species has previously been known with certainty only from the two collections originally cited, but it is quite frequent in the dense shady forest of north-central Viti Levu. I did not observe it at lower elevations than about 750 m., from which it extends upward to the mossy forest of higher ridges, as on Mt. Tomanivi. In this montane forest it is one of the more attractive and striking plants, with its small red fruiting heads. In habit it is a liana, often high-climbing and with the lower parts of the stems appressed to tree-trunks, or it may appear to be an epiphytic shrub. The cited specimens are all pistillate with the exception of no. 5987, which bears staminate flowers. The following slight amplification of the original description is now permitted:

Petioles up to 10 mm. long; leaf-blades up to 11×3 cm.; ♂ inflorescences solitary or paired, the cymes simple, the peduncles 10–15 mm. long at anthesis, the receptacle swollen; flowers 8–15 per cyme, the pedicels slender, at anthesis 5–6 mm. long; sepals about 2 mm. long and 1.5 mm. broad; stamens 5, the filaments about 1.5 mm. long, the anthers about 1.2 mm. long, the thecae divergent.

LORANTHACEAE

Korthalsella Horneana v. Tiegh. in Bull. Soc. Bot. France 43: 164. 1896; Danser in Bull. Jard. Bot. Buitenz. III. 14: 128. fig. 5. 1937.

VITI LEVU: Mba : Summit of Mt. Koroyanitu, high point of Mt. Evans Range, alt. 1165–1195 m., *Smith 4227* (A, US), *4228* (A, US) (parasitic shrubs, in dense ridge forest and thickets, the branches up to 50 cm. long,

copiously branching); Nandarivatu, alt. about 830 m., *Greenwood 840* (A) (on *Geissois ternata*). Fiji, without definite locality: *U. S. Expl. Exped.* (US); *Horne 894* (TYPE COLL., GH).

The cited material is of interest because Danser mentioned only the type collection as representing the species. My numbers 4227 and 4228, although growing together, were separately numbered because of a slight difference observed in the field. No. 4227 is quite typical, with terete branches. In no. 4228, however, the lower internodes of the branches have a distinct tendency toward flattening, although they do not approach in form the conspicuously flattened internodes of *K. platycaula* var. *vitiensis* (v. Tiegh.) Danser, the only other entity of the genus known from Fiji (cf. Danser in *Bull. Jard. Bot. Buitenz. III. 16: 337. 1940*). The diverse character of the colony examined on Mt. Koroyanitu indicates that some variation must be expected in the branch-shape of *K. Horneana*.

SANTALACEAE

Exocarpus vitiensis A. C. Sm. in *Sargentia* 1: 29. 1942.

VITI LEVU: Mba [formerly Nandi]: Vuniyasi, alt. about 60 m., *P. Lasalaba 2356* (A) (tree, on open hills). VANUA LEVU: Mathuata: Southern slopes of Mt. Numbulua, east of Lambasa, alt. 100–350 m., *Smith 6391* (A, US) (compact tree to 7 m. high, in open forest, the trunk straight, slender; flower-buds green).

This species has previously been known only from the two specimens originally cited, from Nandarivatu on Viti Levu and from Vanua Mbalavu. Although the specimens mentioned above have somewhat smaller leaves than the original material, and although no. 6391 has occasionally branched inflorescences, they may be referred to the species with confidence.

OLACACEAE

Anacolosa lutea Gillespie in *Bishop Mus. Bull.* 91: 5. fig. 3. 1932.

VITI LEVU: Mba: Immediate vicinity of Nandarivatu, alt. 800–900 m., *Smith 5042* (A, US) (slender tree 5 m. high, in dense forest along stream; fruit yellow). VANUA LEVU: Mathuata: Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, alt. 100–200 m., *Smith 6726* (A, US) (tree 6 m. high, in patches of forest in open rolling country; petals white); southern slopes of Mt. Numbulua, east of Lambasa, alt. 100–350 m., *Smith 6377* (A, US) (tree 4 m. high, in open forest; fruit yellow); summit ridge of Mt. Numbulua, alt. 500–590 m., *Smith 6455* (A, US) (slender tree 4 m. high, in dense forest; calyx and petals pink-tinged; fruit yellow, becoming pink); Thakauandro: Hills between Vatukawa and Wainio Rivers, Ndrekeniwai Valley, alt. 200–500 m., *Smith 582* (NY, US, etc.) (tree, in forest; petals white); southwestern slopes of Mt. Mbatini, alt. 300–700 m., *Smith 625* (NY, US, etc.) (slender shrub 5 m. high, in dense forest). TAVEUNI: Western slope, between Somosomo and Wairiki, alt. 300–600 m., *Smith 914* (NY, US, etc.) (tree 8 m. high, in forest; petals white). Koro: Eastern slope of main ridge, alt. 200–300 m., *Smith 947* (NY, US, etc.) (tree 10 m. high, in forest; fruit dull yellow to salmon-pink).

In describing this interesting species, Gillespie cited his no. 4040, from Nandarivatu, as the type, mentioning six other collections, without detailed localities, from Naitasiri and Tholo North [i.e. for the most part now Mba] Provinces. As it has apparently not been discussed since the original description, I venture to cite the collections above to give a more complete picture of its distribution throughout the group. There is more variation in size and pubescence of parts than indicated by Gillespie, but at this time I find no reason to subdivide his concept.

BALANOPHORACEAE

Balanophora fungosa J. R. & G. Forst. Char. Gen. 100. 1776; A. C. Sm. in Sargentia 1: 30. 1942.

VITI LEVU: Mba [formerly Nandi]: Northern slopes of Mt. Namendre, east of Mt. Koromba [Pickering Peak], alt. 750-900 m., *Smith 4525* (A, US) (root-parasite in dense forest; plant-body, including perianth and stamens, white).

The cited collection is only the third of the species from Fiji known to me, and represents the only locality in which I have seen the plant growing. Here it occurred with some frequency, and one may assume that it is more common in Fiji than the sparse herbarium record indicates.

ARISTOLOCHIACEAE

Aristolochia vitiensis sp. nov.

Frutex volubilis alte scandens, partibus juvenilibus fulvo-retrorso-pilosis, caule gracili inferne haud 3 mm. diametro tereti striato mox glabro; petiolis gracilibus ut caulibus evanescenter pilosis foliorum maturorum 5-8 cm. longis; laminis in sicco subpapyraceis fuscis late ovatis, maturitate 9-15 cm. longis et 7-10.5 cm. latis, basi leviter cordatis vel truncato-rotundatis, apice in acuminem subobtusum ad 15 mm. longum abrupte angustatis, margine planis haud undulatis, utrinque glabris vel juvenilibus secus nervos obscure fusco-pilosis, e basi 7-nerviis, costa nervisque primariis utrinque valde elevatis, nervis secundariis et rete venularum intricato minus prominulis; inflorescentia post anthesin racemosa vel paniculata pauciramosa, rhachi gracili ad 4 cm. longa ut bracteis oblongo-deltoides obtusis 2-2.5 mm. longis fusco-pilosa, pilis bractearum breviter crispatis, pilis pedicellorum fructuumque juvenilium retrorsis subappressis circiter 0.5 mm. longis; pedicellis sub fructu maturo ad 15 mm. longis; capsula oblongo-ellipsoidea hexagona stipite excluso 3-3.2 cm. longa, circiter 2 cm. lata, apice rotundata, basi in stipitem 1.5-2 cm. longum abrupte angustata, a basi dehiscente, pericarpio inferne pilis paucis obscure piloso demum glabro, angulis validis in stipitem conspicue decurrentibus; seminibus numerosis horizontalibus cuneato-obovatis, 7-9 mm. longis, 6-7 mm. latis, utrinque inconspicue verruculosi.

VITI LEVU: Nandronga & Navosa: Northern portion of Rairai-matuku Plateau, between Nandrau and Nanga, alt. 725-825 m., Aug. 4,

1947, *Smith 5484* (A TYPE, US) ("wa sou"; vine in dense forest). Fiji, without definite locality, *Horne 735* (GH).

Although the genus *Aristolochia* has hitherto been mentioned from Fiji only by Horne (A Year in Fiji, 257. 1881), without a specific designation, Mr. William Greenwood (in an unpublished list) also records a specimen of the genus, possibly of the species described above. Although neither the Horne collection nor mine has flowers, I venture to describe what appears to be a very distinct entity. Its closest ally is probably the Samoan *A. cortinata* Reinecke, than which it has leaf-blades more broadly ovate and merely truncate or shallowly (not deeply) cordate at base. *Aristolochia vitiensis* has the inflorescence-branches, bracts, pedicels, and young fruits obviously pilose, whereas these parts are glabrous in *A. cortinata*. The mature fruits and seeds of the Fijian species are substantially smaller than those of *A. cortinata*.

ANNONACEAE

Desmos leucanthus sp. nov.

Frutex gracilis ad 2 m. altus, ramulis gracilibus teretibus juventute castaneis minute hispidulis mox glabris cinerascentibus; petiolis inconspicuis 2–3 mm. longis validis (1.5–2 mm. diametro) rugulosis mox glabris; laminis chartaceis in sicco pallide viridibus ovato-oblongis, 9–16 cm. longis, 4–7 cm. latis, basi rotundato-cordatis, apice obtusis vel obtuse cuspidatis, margine subplanis, costa subtus interdum obscure strigillosa excepta utrinque glabris, costa supra plana subtus prominente, nervis secundariis utrinsecus 8–10 subpatentibus irregularibus marginem versus copiose anastomosantibus cum rete venularum intricato utrinque prominulis; inflorescentiis 1-floris axillaribus, rhachi valde reducta haud 1 mm. longa, pedicello sub anthesi subtereti valde ruguloso valido (circiter 1.5 mm. diametro) circiter 1 cm. longo parce strigilloso bracteis 2 vel 3 minutis deltoideis subtento; calyce rotato sub anthesi circiter 10 mm. diametro utrinque ruguloso, lobis 3 valvatis late deltoideis circiter 4 mm. longis et 5 mm. latis subacutis, utrinque apicem versus obscure ferrugineo-tomentellis, margine ciliolatis, alioqui glabris; petalis 6 biseriatis valvatis patentibus crasso-carnosis copiose immerso-luteo-glandulosis, utrinque (intus sparsius) cinereo-tomentellis, exterioribus 3 ovato-deltoideis 18–20 mm. longis 10–11 mm. latis basi leviter contractis apice subacutis margine demum paullo reflexis, interioribus 3 ovato-lanceolatis 15–16 mm. longis 5–6 mm. latis basi angustatis apice subacutis; receptaculo complanato pilis stramineis circiter 0.5 mm. longis copiose hispido; staminibus numerosis pluriseriatis 2–2.3 mm. longis, filamento subnullo, connectivo carnoso superne valde incrassato et complanato apice 1–1.2 mm. lato, thecis lineari-oblongis; carpellis circiter 7 liberis, ovario oblongo-ellipsoideo sub anthesi 2.5–3 mm. longo basi obtuso apice rotundato, immerso-luteo-glanduloso, pilis circiter 0.3 mm. longis copiose aureo-sericeo, ovulis circiter 7 oblique superpositis.

VITI LEVU: Nandronga & Navosa: Northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, alt. 725–825 m., Aug. 11, 1947, *Smith 5613* (A TYPE) (slender shrub 2 m. high, in dense forest; perianth-segments dull white, the three inner ones pinkish at base; stamens dull white; carpels brownish).

The characters of the plant described above seem so definitely to be those of *Desmos* that I venture to describe it, despite the fact that it is a unicate specimen with only a single flower. From the only previously known Fijian species of the genus, *D. insularis* A. C. Sm., the new species differs in its essentially glabrous habit and its larger and proportionately broader leaf-blades. The flowers of *D. leucanthus* are apparently considerably the larger, with less copiously pubescent perianth-segments, and its carpels are densely golden-sericeous, rather than sparsely setulose.

***Polyalthia habrotricha* sp. nov.**

Frutex gracilis ad 2 m. altus, ramulis gracilibus teretibus apicem versus 1–2 mm. diametro pilis subtilibus ochraceis 0.3–0.6 mm. longis copiose setulosis, demum glabrescentibus cinereis; petiolis subteretibus rugulosis 1–1.5 mm. diametro 2–3 mm. longis ut ramulis pilosis glabrescentibus; laminis chartaceis siccitate fusco-viridibus elliptico- vel ovato-oblongis, 6–10.5 cm. longis, 3–4.5 cm. latis, basi inaequilateraliter rotundatis vel subcordatis, apice obtusis, margine leviter recurvatis, marginibus et costa utrinque et nervis principalibus subtus ut ramulis subtiliter ochraceo-setulosis alioqui glabris, costa supra subplana vel leviter sulcata subtus elevata, nervis secundariis utrinsecus 6–9 subpatentibus anastomosantibus cum rete venularum utrinque prominulis; infructescentiis solitariis interdum apicem versus ramulorum lateralium brevium enatis, pedicello tereti valido circiter 2.5 mm. diametro et 5 mm. longo copiose et arcte hispidulo, lobis calycis persistentibus 3 subcoriaceis deltoideis acutis circiter 3×4 mm. extus et apicem versus intus breviter sericeis; receptaculo subcapitato circiter 5 mm. diametro strigilloso-puberulo; carpellis maturis ut videtur 5 vel 6 breviter stipitatis copiose et arcte ochraceo-velutino-puberulis, stipitibus validis teretibus 1–2 mm. longis, carpellis subglobosis 14–17 mm. diametro basi et apice rotundatis, pericarpio coriaceo 1.5–2 mm. crasso, semine unico subgloboso.

VITI LEVU: Nandronga & Navosa: Northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, alt. 725–825 m., Aug. 11, 1947, *Smith 5614* (A TYPE) (slender shrub 2 m. high, in dense forest).

From *P. amygdalina* (A. Gray) Gillespie, to which it is closely related, *P. habrotricha* differs in the copious pubescence of its branchlets, petioles, and fruits, and in having its mature carpels rounded rather than obtusely cuspidate at apex. In 1936 (in Bishop Mus. Bull. 141: 60) I indicated that *P. amygdalina* has the receptacle and fruiting carpels glabrous, but a closer examination of the type shows these parts to be sparsely brown-puberulent, although not as densely velutinous-puberulent as in the new species. *Polyalthia amygdalina* is thus far known only from Ovalau. The new species differs from *P. Laddiana* A. C. Sm., which it resembles in

foliage, in its pubescent vegetative parts and its very differently shaped fruiting carpels.

The type of *P. habrotricha* grew near the plant described above as *Desmos leucanthus*; of each of these two species only a single specimen was observed and no duplicates could be made.

Polyalthia pedicellata A. C. Sm. in Bishop Mus. Bull. 141: 61. fig. 29. 1936, in *Sargentia* 1: 32. 1942.

VITI LEVU: Mba: Hills east of Nandala Creek, about 3 miles south of Nandarivatu, alt. 850–970 m., *Smith 6220* (A, US) (tree 6 m. high, in dense forest; fruit, as far as observed, composed of a single green carpel); hills between Nggalawana and Tumbeindreketi Creeks, east of the sawmill at Navai, alt. 725–800 m., *Smith 6009* (A, US) (slender tree 12 m. high, in dense forest; fruit green, on trunk); western and southern slopes of Mt. Tomanivi [Mt. Victoria], alt. 850–1150 m., *Smith 5116* (A, US) (“kai sou”; tree 20 m. high, in dense forest; perianth-segments and genitalia yellowish green; fruit associated with leaves or on branchlets); Nandronga & Navosa: Northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, alt. 725–825 m., *Smith 5629* (A, US) (“singasa”; tree 20 m. high, in dense forest; fruit on trunk and branches, the mature carpels orange).

Previously known from the type, from Vanua Levu, and two specimens from upland Viti Levu, all in fruit. The present collections make possible a slight amplification of the original description; all bear fruit and no. 5116 is also in flower.

Petioles slender, 2–5 m. high, the leaf-blades sometimes as small as 8×2.5 cm., often acute at base; flowers glabrous throughout (except ovaries), solitary at anthesis if associated with leaves, but apparently aggregated when occurring on branches and trunk, the much reduced peduncle bearing 1–3 abortive buds in the axils of obscure bracts; pedicels slender, (20–)35–40 mm. long at anthesis; calyx about 5 mm. in diameter, the lobes deltoid, subacute, about 1×2.5 mm.; petals of both whorls essentially similar, subcarinate, narrowly elliptic-lanceolate, 28–32 mm. long, 8–10 mm. broad, narrowed at base, rounded-obtuse at apex; stamens about 55, 4- or 5-seriate, 1.4–1.6 mm. long, 1–1.4 mm. in diameter at apex, the thecae 0.8–1 mm. long; carpels 15–20, about 1.5 mm. long, the ovary 0.8–1 mm. long, strigose with hairs 0.1–0.2 mm. long but presumably soon glabrescent, 1-ovulate, the stigma carinate, irregular, glabrous; mature carpels usually 8–11 but rarely (no. 6220) apparently solitary, the stalks up to 8 mm. long, stout, the carpels up to 4.5 cm. long and 1.5 cm. broad, rounded to obtuse at apex.

Polyalthia capillata sp. nov.

Arbor gracilis ad 5 m. alta, ramulis gracilibus teretibus rugulosis pilis 0.2–0.3 mm. longis subpersistentibus fulvo-crispato-pilosis vel parce sericeis; petiolis validis (2–3 mm. diametro) rugulosis leviter canaliculatis 8–12 mm. longis ut ramulis pilosis; laminis in sicco papyraceis pallide viridibus elliptico-oblongis, 15–22 cm. longis, 7–9 cm. latis, basi rotundato-obtusis

et in petiolum subito decurrentibus, apice in acuminem circiter 1.5 cm. longum obtusum cuspidatis, margine leviter recurvatis, costa nervisque principalibus inferne ut ramulis pilosis exceptis subglabris, costa valida supra subplana subtus prominente, nervis secundariis utrinsecus 7–10 leviter curvatis copiose anastomosantibus utrinque valde elevatis, rete venularum intricato utrinque prominulo; infructescentiis cauligeris ubique (pedicello, receptaculo, carpellisque maturis) pilis ut eis ramulorum parcius pilosis, pedicello circiter 2 mm. diametro sub fructu 3–4 cm. longo, lobis calycis persistentibus 3 coriaceis deltoideis obtusis 3–4 mm. longis latisque; receptaculo subcapitato circiter 7 mm. diametro basibus stipitum conspicue tuberculato; carpellis maturis circiter 10–12 stipitatis (stipitibus crassis 5–10 mm. longis) anguste conico-ellipsoideis, 25–30 mm. longis, inferne 6–8 mm. diametro superne sensim angustato, basi in stipitem abrupte angustatis, apice subacutis, pericarpio coriaceo minute ruguloso maturitate forsan glabrescente; semine unico erecto.

VITI LEVU: Nandronga & Navosa: Southern slopes of Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, alt. 300–450 m., May 29, 1947, *Smith 4581* (A TYPE, US) (slender tree 5 m. high, in dense forest; fruit borne on trunk).

Polyalthia capillata is closely related only to *P. pedicellata* A. C. Sm., which it resembles in its leaf-base, its elongate fruiting pedicel, and in the general proportions of its mature carpels. It differs from *P. pedicellata*, however, in the subpersistent crispate or sericeous pubescence of its branchlets, leaves, and fruits, in its larger leaves, and in having its fruiting carpels somewhat conical rather than oblong-ellipsoid.

Polyalthia amoena sp. nov.

Arbor ad 7 m. alta partibus novellis pilis 0.2–0.3 mm. longis ochraceo-sericeis fructibusque exceptis glabra; ramulis gracilibus teretibus, annotinis cinereis inconspicue lenticellatis, hornotinis purpurascentibus flexuosis; petiolis gracilibus (1–1.3 mm. diametro) canaliculatis 2–5 mm. longis; laminis in sicco papyraceis fusco-viridibus lanceolatis, 6.5–13 cm. longis, 1.7–3.5 cm. latis, basi acutis et in petiolum decurrentibus, apice in acuminem subobtusum ad 1.5 cm. longum sensim angustatis, margine integris, inconspicue sed conferte pellucido-punctatis, costa supra subplana subtus prominente utrinque basim versus verruculosa, nervis secundariis utrinsecus 6–9 brevibus 3–8 mm. infra marginem arcuato-anastomosantibus utrinque peracute prominulis, rete venularum utrinque plus minusve prominulo; infructescentiis axillaribus solitariis pedicellatis, pedicello sub fructu 2–3.5 cm. longo gracili tereti inferne circiter 1 mm. diametro apicem versus paullo incrassato, receptaculo subcapitato circiter 5 mm. diametro inconspicue ochraceo-piloso glabrescente basibus stipitum tuberculato; carpellis maturis ut videtur plerumque 10–20 stipitatis (stipitibus 1–2 cm. longis inferne gracilibus superne incrassatis) oblongo-ellipsoideis, 15–17 mm. longis, 7–10 mm. latis, basi in stipitem abrupte angustatis, apice obtusis, pericarpio coriaceo minute ruguloso superne subpersistenter brevi-ochraceo-sericeo; semine unico adscendente.

VANUA LEVU: Mathuata: Summit ridge of Mt. Numbuiloa, east of Lambasa, alt. 500-590 m., Oct. 29, 1947, *Smith 6423* (A TYPE, US) (tree 7 m. high, in dense forest; fruiting carpels orange); southern slopes of Mt. Numbuiloa, alt. 100-350 m., *Smith 6380* (A, US fragm.) ("sitiloa"; slender tree 4 m. high, in open forest; fruit becoming orange).

In foliage the new species suggests, among Fijian species, only *P. angustifolia* A. C. Sm., from which it differs in having its petioles shorter and its leaf-blades thinner in texture, with straighter secondaries and more obvious venation. *Polyalthia amoena* has its fruiting carpels comparatively narrow and with conspicuous long stipes; the carpel-stipes of *P. angustifolia* are scarcely 2 mm. long.

CYATHOCALYX Champion

Several Fijian specimens that have been identified as *Cananga odorata* (Lam.) Hook. f. & Thoms., upon close examination, prove not to belong to that widespread species, from which they differ superficially in having the leaf-blades somewhat thicker in texture and obtusely rounded to acute (but scarcely truncate or subcordate, like typical *C. odorata*) at base. At least some of the specimens in question have fragrant flowers and are called by the Fijians "makosoi," thus resembling *Cananga odorata*, which does occur in Fiji and is represented by such specimens as *Seemann 5* and *Smith 1291* and *4449*. From *Cananga* the specimens under discussion differ in the readily discernible technical characters of having the petals connivent about the genitalia rather than spreading from the base, and in having the anthers truncate rather than apiculate at apex. Apparently these specimens can be referred only to the genus *Cyathocalyx*, hitherto supposed to be represented in Fiji by the single species *C. vitiensis*.

The Fijian material of *Cyathocalyx* now available appears to me to fall into four species, of which three are here described as new. Apparently dependable characters are the shape and pubescence of perianth-segments and, within certain limits, the number of stamens, carpels, and ovules. The inter-relationships of the four species may be indicated by the following key.

Petals 15-25 mm. long at anthesis, the spreading portions oblong-elliptic or elliptic-lanceolate from a contracted base, at anthesis 4-8 mm. broad; sepals broadly ovate, the base obviously narrowed.

Leaf-blades obovate or elliptic, 10-16 × 5-8.5 cm., obtuse or rounded or emarginate at apex, the secondary nerves 10-14 per side, straight or slightly curved, spreading; stamens about 150; carpels about 20, the ovules several per carpel.....*C. vitiensis*.

Leaf-blades comparatively narrow, 9-20 × 4-8 cm., obtusely cuspidate at apex with an acumen 3-7 mm. long, the secondary nerves 9-12 per side, curved-ascending; stamens 55-85; carpels 8-10, the ovules 2 or 3 per carpel, rarely 5 or 6 in early stages but apparently only 2 or 3 developing.....*C. insularis*.

Petals 30-50 mm. long at anthesis, the spreading portions ligulate, hardly contracted at base, at anthesis 2-4.5 mm. broad; sepals ovate-deltoid, hardly narrowed at base.

Leaf-blades 9-17 × 4.5-8 cm., obtuse or subacute at base, the secondary nerves 7-10 per side; flowers (pedicels, calyx, and petals) puberulent, glabrescent; carpels 9 or 10, the ovules 2 per carpel... *C. stenopetalus*.

Leaf-blades usually 15-32 × 8-12 cm., rounded or broadly obtuse at base, the secondary nerves 11-15 per side; flowers (pedicels, calyx, and petals) closely and persistently tomentellous; carpels 5-7, the ovules 6 or 7 per carpel..... *C. suaveolens*.

Cyathocalyx vitiensis A. C. Sm. in Bishop Mus. Bull. 141: 64. fig. 31. 1936.

Among the Fijian material of *Cyathocalyx* now available, *C. vitiensis* seems to be represented only by the two collections from Vanua Levu which I originally cited. The Degener specimens which in 1942 I mentioned as representing this species are better referred to *C. insularis*, described below. My description of 1936 was in error in mentioning the seeds as very numerous and only 2 mm. long; they appear to be usually 3 and to occupy the entire carpellary cavity.

Cyathocalyx insularis sp. nov.

Cyathocalyx vitiensis sensu A. C. Sm. in Sargentia 1: 33. 1942, non sensu typi.

Arbor ad 18 m. alta, partibus novellis et inflorescentiis puberulis exceptis ubique glabra; ramulis subteretibus, annotinis cinereis sat robustis, hornotinis saepe purpurascens subflexuosis gracilibus; petiolis gracilibus leviter canaliculatis 17-30(-38) mm. longis; laminis subcoriaceis siccitate fuscis vel fusco-olivaceis, oblongo- vel obovato-ellipticis, 9-20 cm. longis, 4-8 cm. latis, basi acutis vel obtusis saepe inaequalibus et in petiolum decurrentibus, apice in acuminem 3-7 mm. longum obtuse cuspidatis, margine leviter recurvatis, costa supra canaliculata subtus prominente, nervis secundariis utrinsecus 9-12 curvato-adscendentibus marginem versus anastomosantibus supra prominulis subtus acute elevatis, rete venularum utrinque subprominulo vel subimmerso; inflorescentiis glomerulatis oppositifoliis vel infra folia enatis 1-3-floris, bracteis papyraceis oblongo-deltoides obtusis circiter 1 mm. longis subglabris; pedicellis gracilibus sub anthesi 20-30 mm. longis glabratis basim versus unibracteolatis, bracteola oblonga obtusa 3-5 × 2 mm. apice rotundata albido-puberula mox glabra; sepalis 3 papyraceis late ovatis, 6.5-8 mm. longis, 5-7 mm. latis, glabris vel obscure puberulis, basi conspicue angustatis, apice obtusis vel subacutis; petalis 6 carnosissimis sub anthesi 15-25 mm. longis, partibus basalibus concavis suborbicularibus 2.5-5.5 mm. latis extus obscure puberulis, petalorum interiorum apicem versus ventro glanduloso-pilosis, petalorum partibus patentibus oblongo-ellipticis 4-8 mm. latis obtusis parce albido-puberulis basi contractis, petalorum interiorum paullo angustioribus et basi connatis; receptaculo complanato glabro vel inconspicue hispidulo; staminibus 3-5-seriatis 55-85 oblongo-obovoideis, 1.5-1.8 mm. longis, apice 0.7-1 mm. latis, filamentis subclavatis 0.2-0.5 mm. longo, connectivo carnoso saepe obscure luteo-glanduloso superne incrassato truncato, thecis oblongis; carpellis 8-10 glabris vel debiliter hispidulis,

ovario oblongo-ellipsoideo sub anthesi 1–1.5 mm. longo, ovulis 2 vel 3 (raro juventute ad 5 vel 6), stigmatibus coalitis; infructescentiis ubique glabris, receptaculo subcapitato 4–5 mm. diametro, pedicello 35–50 mm. longo, stipitibus 4–7 mm. longis, carpellis maturis 3–7 ellipsoideis saepe inter semina contractis 10–16 mm. longis 8–12 mm. latis, pericarpio coriaceo subtiliter ruguloso circiter 0.5 mm. crasso, seminibus plerumque 2 (interdum 1 vel 3) oblique superpositis.

VITI LEVU: Mba: Hills between Nggaliwana and Tumbeindreketi Creeks, east of the sawmill at Navai, alt. 725–800 m., Sept. 2, 1947, *Smith 5868* (A TYPE, US) (tree 18 m. high, in dense forest; perianth greenish, becoming dull yellow; fruiting carpels green, at length deep purple); same locality, Sept. 12, 1947, *Smith 6003* (A, US) (tree 15 m. high; young perianth-segments greenish yellow); Mt. Natomba, Nandala, vicinity of Nandarivatu, alt. 750 m., *Degener 14638* (A, US) ("makosoi"; tree, in forest; perianth green; bark used for rope); vicinity of Nandarivatu, alt. 900 m., *Gillespie 3854* (GH); Namosi: Woods above waterfall near Namuamua, alt. 400 m., *Gillespie 3252* (GH, US); Mt. Naitarandamu, alt. 1100 m., *Gillespie 3145* (GH, US); Naitasiri: Vicinity of Nasinu, alt. 150 m., *Gillespie 3524* (GH), *3612* (GH, US); Suva Pumping Station, alt. 30 m., *Degener & Ordenez 13744* (A, US) (few-branched tree 5 m. high, in open forest; flowers greenish). Fiji, without definite locality: *Horne 987* (GH).

From *C. vitiensis* A. C. Sm., which it resembles in perianth-characters, the new species differs slightly in foliage and more definitely in the reduced number of stamens and carpels. The observed number of ovules per carpel has been usually 2, rarely 3, and in only one case (*Smith 6003*) are they more numerous, but here the flowers are immature and it is doubtful that all the ovules develop.

Cyathocalyx stenopetalus sp. nov.

Arbor ad 15 m. alta, partibus novellis puberulis et inflorescentiis exceptis ubique glabra; ramulis teretibus, annotinis fusco-cinereis parce lenticellatis, hornotinis purpurascentibus gracilibus; petiolis leviter rugulosis canaliculatis 20–37 mm. longis; laminis subcoriaceis in sicco fusco-viridibus, ellipticis vel obovato-ellipticis, 9–17 cm. longis, 4.5–8 cm. latis, basi obtusis vel subacutis et in petiolum inaequilateraliter decurrentibus, apice rotundatis vel obtuse cuspidatis, margine haud recurvatis, costa supra canaliculata subtus prominente, nervis secundariis utrinsecus 7–10 erecto-patentibus subrectis vel leviter curvatis marginem versus anastomosantibus supra paullo subtus valde elevatis, rete venularum subtus evidenter prominulo; inflorescentiis glomerulatis vel breviter racemosis oppositifoliis vel infra folia enatis 1–5-floris, glomerulis vel rhachibus (interdum ad 1 cm. longis) parce brevi-pilosis glabrescentibus saepe cicatricosis, bracteis papyraceis deltoideis subacutis circiter 1.5 mm. longis extus puberulis; pedicellis gracilibus sub anthesi 20–35 mm. longis parce puberulis glabrescentibus paullo infra medium unibracteolatis, bracteola oblonga obtusa 2–3 mm. longa obscure puberula; sepalis 3 papyraceis ovato-deltoideis, 4–6 mm. longis, 3–4.5 mm. latis, apice apiculatis et saepe

reflexis, extus inconspicue puberulis; petalis 6 carnosus sub anthesi 30–45 mm. longis, partibus basalibus concavis 3.5–5 mm. latis extus puberulis, petalorum partibus patentibus lanceolato-ligulatis obtusis 2–4.5 mm. latis ubique parce albido-puberulis demum subglabrescentibus, petalorum interiorum paullo angustioribus et basi connatis; receptaculo complanato obscure setuloso; staminibus circiter 3-seriatis 40 (vel ultra?) oblongo-obovoideis, 1.2–1.5 mm. longis, apice 0.6–0.7 mm. latis, filamento minuto, connectivo superne incrassato et truncato, thecis oblongis; carpellis 9 vel 10 parce stramineo-sericeis, ovario oblongo-ovoideo sub anthesi 1–1.2 mm. longo, ovulis 2 oblique superpositis, stigmatibus coalitis; infructescentiis mox glabrescentibus, receptaculo circiter 5 mm. diametro, pedicello 35–45 mm. longo, stipitibus 7–8 mm. longis, carpellis submaturis 3–7 oblongo-ellipsoideis ad 15×10 mm. saepe inter semina contractis, pericarpio coriaceo sublevi, seminibus 2 raro 1.

VANUA LEVU: Mathuata: Southern base of Mathuata Range, north of Natua, alt. 100–250 m., Dec. 1, 1947, *Smith 6778* (A TYPE, US) (tree 15 m. high, in dense forest; perianth-segments yellowish green); Mbu a: Southern slope of Mt. Seatura, alt. 600 m., *Smith 1681* (GH, NY, US) ("mako"; tree 15 m. high, in dense forest; perianth-segments yellowish green). Fiji, without definite locality: *Horne 430* (GH).

Cyathocalyx stenopetalus is most readily distinguished from *C. vitiensis* and *C. insularis* by its narrow ligulate petals and smaller sepals; in foliage it closely resembles *C. insularis*, but its leaves usually have fewer secondary nerves. The new species also has comparatively few stamens, but variability in this character is apparently considerable in *Cyathocalyx*.

Cyathocalyx suaveolens sp. nov.

Arbor ad 20 m. alta, partibus novellis dense sericeis, ramulis sat robustis teretibus primo purpurascens et ferrugineo-puberulis demum glabrescentibus cinereis; petiolis validis (2–3 mm. diametro) rugulosis leviter canaliculatis mox glabrescentibus 20–30 mm. longis; laminis coriaceis vel subpapyraceis siccitate fusco-olivaceis, oblongo-ellipticis, (11–)15–32 cm. longis, (6–)8–12 cm. latis, basi rotundatis vel late obtusis et in petiolum saepe inaequilateraliter decurrentibus, apice in acuminem circiter 5 mm. longum obtuse cuspidatis, margine leviter recurvatis, utrinque costa et nervis principalibus inconspicue puberulis mox glabrescentibus, costa valida supra canaliculata subtus prominente, nervis secundariis utrinsecus 11–15 subpatentibus leviter curvatis vel subrectis anastomosantibus utrinque evidenter elevatis, rete venularum inconspicuo utrinque plerumque prominulo; inflorescentiis breviter racemosis vel subglomerulatis oppositifoliis vel infra folia enatis, rhachi solitaria vel 2–4 aggregata circiter 3 mm. diametro plerumque 5–15 mm. longa conspicue cicatricosa apicem versus 1–3-flora pilis ferrugineis circiter 0.1 mm. longis arcte tomentella, bracteis papyraceis late deltoideis circiter 1.5 mm. longis extus tomentellis mox caducis; pedicellis calyce petalisque ut rhachi dense et persistenter ferrugineo- vel fusco-tomentellis, pedicello gracili sub anthesi 15–25 mm. longo basim versus obscure unibracteolato, bracteola oblonga obtusa 2–3 mm.

longa; sepalis 3 carnis ovato-deltaideis, 5–7 mm. longis, 4–6 mm. latis, apice subacutis et saepe reflexis, intus basim versus glabris; petalis 6 carnis sub anthesi 30–50 mm. longis, partibus basalibus concavis sub-orbicularibus 5–6 mm. latis intus glabris, petalorum interiorum apicem versus ventro glanduloso-pilosis, petalorum partibus patentibus ligulatis 3–4.5 mm. latis, petalorum interiorum paullo angustioribus et basi connatis; receptaculo complanato obscure hispidulo; staminibus 3–5-seriatis circiter 55–75 obovoideis, 1.2–1.5 mm. longis, apice 0.6–1 mm. latis, filamento carnoso ad 0.2 mm. longo, connectivo superne incrassato et truncato, thecis lineari-oblongis; carpellis 5–7 parce albido-villosis, ovario oblongo-ovoideo sub anthesi 1.5–2 mm. longo, ovulis 6 vel 7, stigmatibus coalitis; pedicello sub fructu valido 30–35 mm. longo et receptaculo subcapitato circiter 5 mm. diametro subpersistenter tomentellis, stipitibus 3–5 mm. longis, carpellis maturis 3–6 subglobosis 18–20 mm. diametro, pericarpio coriaceo valde ruguloso primo piloso demum glabrescente, seminibus saepe 3 magnis.

VITI LEVU: Mba: Valley of Nggaliwana Creek, north of the sawmill at Navai, alt. 725–850 m., July 21, 1947, *Smith 5342* (A TYPE, US) (“makosoi”; tree 20 m. high, in dense forest; flowers very fragrant, the perianth-segments yellowish green); vicinity of Nandarivatu, alt. 900 m., *Gillespie 4267* (GH) (tree in dense forest, the trunk about 13 cm. in diameter, tapering, the wood white, very soft; flowers slightly fragrant, the perianth-segments pale green or yellowish). VANUA LEVU: Thakau-drove: Southern slopes of Valanga Range, alt. 200–400 m., *Smith 392* (GH, NY, US) (tree 13 m. high, in dense forest; perianth green). TAVEUNI: Vicinity of Waiyevo, in woods above coconut plantations, alt. 600 m., *Gillespie 4741* (GH, US).

This new species appears to be the most distinct of the Fijian representatives of *Cyathocalyx*, being distinguished not only by its persistently tomentellous flowers, but also by its comparatively large leaf-blades which are rounded or broadly obtuse at base.

Oxymitra monosperma (A. Gray) A. C. Sm. in Bishop Mus. Bull. 141: 62. 1936, in *Sargentia* 1: 33. 1942.

VITI LEVU: Mba: Hills east of Nandala Creek, about 3 miles south of Nandarivatu, alt. 850–970 m., *Smith 5932* (A, US) (slender tree 10 m. high, in dense forest; fruit from branchlets or associated with leaves); western and southern slopes of Mt. Tomanivi [Mt. Victoria], alt. 850–1150 m., *Smith 5111* (A, US) (“vavaloa”; tree 10 m. high, in dense forest; fruit on branches; mature carpels yellowish brown).

The cited specimens, both in fruit, are interesting additions to the known occurrence of this infrequent endemic. The Fijian name “vavaloa” is applied to *Degeneria vitiensis* Bailey & A. C. Sm., and its use for the present species may be questioned (cf. footnote in Jour. Arnold Arb. 30: 3. 1949).

The generic name *Oxymitra* Bl. ex Hook. f. & Thoms. is a later homonym of *Oxymitra* Bischoff, as pointed out by van Steenis (in Bull. Bot. Gard. Buitenz. III. 17: 458. 1948), who proposes the name *Frieso-*

dielsia for the annonaceous genus, without making specific combinations. *Oxymitra* Bl. ex Hook. f. & Thoms. has been proposed for conservation at the next International Botanical Congress.

LEGUMINOSAE

Acacia mathuataensis sp. nov.

Arbor ramis patentibus ubique glabra, ramulis junioribus gracilibus purpurascentibus angulatis rugulosis copiose lenticellatis demum cinereis subteretibusque; phyllodiis planis in sicco subcoriaceis olivaceo-viridibus, lanceolato- vel obovato-ellipticis, (3.5-)4-5 cm. longis, 1.3-2.3 cm. latis, basi in stipitem rugulosum inconspicuum gradatim attenuatis, apice obtusis et abrupte calloso-hamatis, nervis principalibus 9-14 utrinque acute prominulis inter se 1-2 mm. distantibus reticulo inconspicuo interconnexis; pedunculis solitariis vel binis et brevissime racemosis, rhachi inflorescentiae 0.5-2 mm. longa cum pedunculo obscure articulata, bracteis ovato-deltoides 0.5-0.8 mm. longis subacutis obscure glanduloso-ciliolatis, pedunculo tereti gracili sub anthesi 4-5 mm. longo; capitulis sub anthesi staminibus inclusis circiter 5 mm. diametro, floribus sessilibus circiter 45, bracteolis 0.6-0.8 mm. longis inaequilateraliter peltatis, stipite gracili, lamina ovata obscure glanduloso-ciliolata; calyce submembranaceo campanulato circiter 0.7 mm. longo brevidentato, lobis 5 subacutis 0.2-0.3 mm. longis; corolla campanulata circiter 1.5 mm. longa fere ad basim 5-lobata, petalis obovato-lanceolatis obtusis; staminibus liberis 40-45, filamentis filiformibus sub anthesi circiter 2 mm. longis, antheris minutis; stylo sub anthesi 3-4 mm. longo.

VANUA LEVU: Mathuata: Summit ridge of Mt. Numbuiloa, east of Lambasa, alt. 500-590 m., Nov. 6, 1947, *Smith 6521* (A TYPE, US) ("tatanggia"; spreading tree to 6 m. high, in dense summit thickets; petals and stamens bright yellow).

The plant described above is evidently of the general relationship of *A. simplicifolia* (L. f.) Druce [*A. laurifolia* Willd.], differing in its much smaller phyllodia, which have closer primary nerves. *Acacia simplicifolia*, in contrast to *A. mathuataensis*, has the calyx-lobes subspatulate, more nearly free, and distally glandular-pilose; it is the common "tatanggia" of the Fijians and is a widespread strand plant, which I have never observed inland. *Acacia Richii* A. Gray has flowers more nearly resembling those of the new species, but they are fewer per head, the inflorescences are more densely aggregated, and the phyllodia are lanceolate, acuminate at apex, and proportionately much narrower than those of *A. mathuataensis*.

Cynometra falcata A. Gray, Bot. U. S. Expl. Exped. 1: 472. 1854; Horne, A Year in Fiji 260. 1881; A. C. Sm. in Sargentia 1: 38. 1942.

VANUA LEVU: Mathuata: Southern slopes of Mt. Numbuiloa, east of Lambasa, alt. 350-500 m., *Smith 6574* (A, US) ("thimbithimbi"; slender tree 4 m. high, in steep open forest; upper branches subscented). Fiji, without locality or number, *Horne* (GH).

The cited Mathuata collection, which is sterile, was taken from a group of several plants occurring on a very steep rocky hillside in comparatively dry forest; the species has not been elsewhere observed by me. Careful examination of the locality failed to reveal any fertile plants. These are apparently the only collections of *C. falcata* since the type material was obtained in 1840, at or near Mba, in northwestern Viti Levu. No. 6574 agrees precisely with the type in the details of its essentially sessile unijugate leaves, while the Horne specimen has petioles up to 6 mm. in length and leaflets up to 16×5 cm. However, both collections may be referred to *C. falcata* with confidence.

Cynometra insularis A. C. Sm. in *Sargentia* 1: 38. 1942.

VITI LEVU: Mba: Dry gullies and hillsides near Ndrasa, near Lautoka, alt. about 180 m., *Greenwood* 717A (A). VANUA LEVU: Mathuata: Ndreketi River Valley, *R. A. Sykes* 325 (or 47) (A) ("thimbithimbi"; common riverside tree); southern slopes of Mt. Numbuiloa, east of Lambasa, alt. 100-350 m., *Smith* 6382 (A, US) ("thimbithimbi"; tree 25 m. high, in open forest).

The cited collections precisely agree with the type and earlier cited material of the species, which has been known from Viti Levu and Taveuni.

MANILTOA Scheff.

In discussing the Fijian species of *Maniltoa* in 1942 (in *Sargentia* 1: 36-38), I recognized only two species. *Maniltoa grandiflora* (A. Gray) Scheff. has been a puzzling entity since its original description, and subsequent authors have noted that the usual concept of it includes at least two or three forms. Entirely satisfactory analysis of the genus in Fiji is still not possible, but my collections of 1947 permit at least a better understanding of it, and it is seen that more than two species must be admitted. Below I describe three additional species as new, but I suspect that at least one or two more entities in *Maniltoa* in Fiji will eventually be found worthy of specific recognition. The five species now known may be keyed as follows:

Inflorescence-rachis and pedicels glabrous or very sparsely and obscurely puberulent; ovary glabrous or sparsely ferruginous-strigillose distally.

Leaves 10-15 cm. long or more, the leaflets predominantly 3 pairs, rarely 4 pairs (often 2 pairs on distal leaves), $4.5-10 \times 2-5.5$ cm.; flowers comparatively large, the sepals and petals at least 10 mm. long, the filaments at least 15 mm. long.

Inflorescence comparatively ample and large-flowered; rachis about 3 cm. long and pedicels 20-25 mm. long at anthesis; sepals $10-15 \times 4-7$ mm.; petals $12-19 \times 3-4$ mm.; filaments 15-25 mm. long; bracts enclosing leaf- and flower-buds densely sericeous dorsally.
.....*M. grandiflora*.

Inflorescence comparatively compact and small-flowered; rachis about 1 cm. long and pedicels 8-12 mm. long at anthesis; sepals $10-12 \times 2.5-5$ mm.; filaments about 15 mm. long; bracts enclosing leaf- and flower-buds glabrous.....*M. brevipes*.

- Leaves short, not exceeding 7 cm. in length, the leaflets predominantly 2 pairs (1 pair on distal leaves), small, $2.5-4 \times 1.7-2.5$ cm.; flowers comparatively small, the sepals $6.5-7 \times 2-4$ mm., the petals $7-8 \times 1.5$ mm., the filaments 10-12 mm. long.....*M. minor*.
- Inflorescence-rachis and pedicels obviously puberulent or hispidulous; ovary copiously velutinous-puberulent or uniformly hispidulous.
- Leaves predominantly 3-jugate (rarely 4- or 2-jugate), usually more than 15 cm. long; inflorescence-rachis and pedicels copiously pale-puberulent; lateral flower-subtending bracteoles tufted-strigose dorsally near apex, glabrous below; sepals 15-16 mm. long, faintly puberulent dorsally; petals 15-17 mm. long; ovary velutinous-puberulent.....*M. floribunda*.
- Leaves predominantly bijugate (rarely unijugate), up to 10 cm. long; inflorescence-rachis and pedicels copiously ferruginous-hispidulous with hairs 0.3-0.5 mm. long; lateral flower-subtending bracteoles copiously hispidulous along the median dorsal line; sepals 10-13 mm. long, hispidulous-puberulent dorsally; petals 11-14 mm. long; ovary velutinous-hispidulous.....*M. vestita*.

Maniltoa grandiflora (A. Gray) Scheff. in Ann. Jard. Bot. Buitenz. 1: 20. 1876; A. C. Sm. in Sargentia 1: 36. 1942.

In 1942 I discussed the various forms of this species upon which Gray based his concept, designating the specimen (US) from which his *figure B* (of Bot. U. S. Expl. Exped. 1: *pl.* 52. 1854) was drawn as the lectotype. Interpreting the species broadly in 1942, I cited as representing it several specimens which now appear to me to represent a novelty, described below as *M. floribunda*. It is very difficult to identify specimens of *Maniltoa* from foliage alone, and so a thoroughly satisfactory analysis of the limits of *M. grandiflora* must await the collection of better material, with adequate geographical data.

Among the specimens available at present, the best match for the type of *M. grandiflora* is *Seemann 138* in part (GH), without definite locality beyond "Ovalau and Vanua Levu" (Seem. Fl. Vit. 71. 1865). *Seemann 138* is composed of material from three different trees; a second part is referable to *M. minor* A. C. Sm. and a third part is suggestive of *M. floribunda*. The Exploring Expedition specimen (GH) which served as the basis of Gray's *figure A* may also be referred to typical *M. grandiflora*, although its leaflets are narrower than those of the actual type. A sterile specimen from Thakaundrove, Vanua Levu, *Degener & Ordonez 13949* (A), resembles the type of *M. grandiflora* in foliage but cannot confidently be placed here.

The specimens (GH, US) upon which Gray's *figure C* is based are sterile; they come from Ovalau and agree fairly well with the type in foliage, but have the leaves predominantly bijugate. With this Ovalau material the following sterile specimens seem to agree: *Gillespie 4540* (US), from Ovalau, *Smith 1022* (GH, NY, US), from Koro, and *Parham 2463* (A), from the Navua River, Serua, Viti Levu. These four collections cannot confidently be referred to any described species of *Maniltoa* at this time.

Maniltoa brevipes sp. nov.

Arbor ad 20 m. alta partibus inflorescentiae obscure puberulis exceptis ubique glabra dense foliata, ramulis teretibus cinereis conspicue lenticellatis apicem versus subflexuosis; foliis plerumque 10–15 cm. longis 3-jugis vel apicem ramulorum versus 2-jugis, petiolis teretibus rugulosis 8–12 mm. longis, rhachi gracili interdum subflexuosa, petiolulis inconspicuis 1–4 mm. longis; laminis foliolorum subcoriaceis siccitate viridi-olivaceis inaequilateraliter oblongo-ellipticis, (4–)5–7 cm. longis, (1.5–)2–3.5 cm. latis, basi obtusis, apice late obtusis saepe emarginatis, margine integris leviter recurvatis, costa recta vel leviter curvata utrinque valde elevata, nervis secundariis utrinsecus 6–8 marginem versus et cum rete venularum anastomosantibus supra subplanis vel immersis subtus inconspicue prominulis; inflorescentia apicem ramulorum versus axillari breviter racemosa circiter 15-flora juventute bracteis numerosis involucrata, bracteis papyraceis, maximis suborbicularibus ad 15 × 20 mm. dorso glabris margine inconspicue ciliatis apice rotundatis mox caducis; rhachi valida sub anthesi circiter 1 cm. longa basibus florum incrassata, bracteis floriferis medianis oblongo-linearibus 12–13 mm. longis circiter 2 mm. latis dorso hispidulis mox caducis, bracteolis lateralibus oblongo-lanceolatis circiter 2 mm. longis dorso ferrugineo-hispido-strigosis; pedicellis teretibus sub anthesi 8–12 mm. longis glabris vel obscure et evanescenter puberulis in receptaculum cupulatum 2.5–3 mm. diametro et margine in tubum circiter 1 mm. altum productum incrassatis; sepalis 4 sub anthesi reflexis submembranaceis oblongis, 10–12 mm. longis, 2.5–5 mm. latis, glabris vel dorso minutissime puberulis, apice obtusis, petalis non visis; staminibus circiter 35, 1- vel 2-seriatis, filamentis circiter 15 mm. longis, antheris ellipsoideis 1.2–1.5 mm. longis apice apiculatis; ovario glabro breviter stipitato, ovulo solitario, stylo gracili 10–11 mm. longo; pedicello sub fructu valde incrassato 10–14 mm. longo, sepalis staminibusque subpersistentibus, legumine oblique ellipsoideo leviter complanato ad 5 cm. longo et 3.5 cm. lato, basi rotundato, apice obtuse cuspidato, pericarpio valde incrassato et ruguloso.

VANUA LEVU: Mathuata: Near summit of Mt. Uluimbau ["The Three Sisters"], south of Lambasa, alt. 360–369 m., Nov. 13, 1947, *Smith 6600* (A TYPE, US) ("thimbithimbi"; tree 5–10 m. high, in open forest; buds glaucous-green); banks of lower Lambasa River, near sea-level, *Smith 6629* (A, US) ("thimbithimbi"; tree to 20 m. high, with wide-spreading branches, at inner edge of mangrove-swamp).

From *M. grandiflora* (A. Gray) Scheff. the new species differs in its comparatively compact and small-flowered inflorescence, the short pedicels being especially noteworthy, and in having the bracts of its buds glabrous rather than obviously sericeous dorsally. As compared with the actual type of *M. grandiflora*, the new species has obviously narrower leaflets, but foliage characters are not too dependable in this complex; for instance, the leaflets of the specimen upon which Gray based his *figure A* (of Bot. U. S. Expl. Exped. 1: *pl.* 52. 1854) are very similar to those of *M. brevipes*. However, this Exploring Expedition specimen in inflorescence agrees excellently with the type of *M. grandiflora*. I have seen no older collec-

tions which seem conspecific with those described above as *M. brevipes*.

Maniltoa minor A. C. Sm. in *Sargentia* 1: 37. 1942.

No additional specimens of this species have come to my attention since its description. It is well marked in foliage and inflorescence characters, but my original discussion overemphasized the marginal prolongation of the receptacle. This development of the receptacle is perhaps more pronounced in *M. minor* than in other Fijian species of the genus, but the character is not a fundamental one.

Maniltoa floribunda sp. nov.

Arbor ad 23 m. alta partibus juvenilibus et inflorescentiis exceptis glabra, ramulis et foliorum petiolis rhachibus petiolulisque minute cinereo-vel ferrugineo-puberulis mox glabrescentibus, ramulis teretibus validis rugulosis cinereis inconspicue lenticellatis; foliis (10-)15-25(-30) cm. longis, plerumque 3-jugis (raro 4-jugis, apicem ramulorum versus raro 2-jugis), petiolis crassis teretibus 15-25 mm. longis, rhachi plerumque recta, petiolulus rugulosus 2-8 mm. longis; laminis foliolorum subcoriaceis in sicco viridi-olivaceis inaequilateraliter ellipticis vel obovato-oblongis, (6-)7-10 cm. longis, 3-5.5 cm. latis, basi obtusis vel subacutis, apice obtusis vel obtuse mucronatis et saepe emarginatis, margine integris et paullo recurvatis, costa subrecta utrinque prominente, nervis secundariis utrinsecus 6-8 obscure anastomosantibus utrinque immersis vel paullo elevatis, rete venularum intricato utrinque immerso vel prominulo; inflorescentia axillari vel ramulis defoliatis enata breviter racemosa 25-50-flora juventute bracteis numerosis magnis involucreta, bracteis papyraceis, maximis suborbicularibus ad 30×40 mm. apice rotundatis dorso copiose brevi-sericeis margine ferrugineo-ciliatis mox caducis; rhachi crassa sub anthesi 1-3 cm. longa copiose cinereo-puberula basibus florum conspicue incrassata, bracteolis lateralibus lineari-lanceolatis 2-5 mm. longis dorso apicem versus copiose strigosis inferne glabris mox caducis; pedicellis teretibus sub anthesi 20-35 mm. longis ut rhachi copiose puberulis in receptaculum circiter 3 mm. diametro incrassatis; sepalis 4 sub anthesi reflexis submembranaceis elliptico-oblongis, 15-16 mm. longis, 4-8 mm. latis, dorso inconspicue puberulis, apice obtusis; petalis 5 membranaceis obovato-lanceolatis, 15-17 mm. longis, 3-4 mm. latis, inferne angustatis, apice subacutis; staminibus circiter 40, 1- vel 2-seriatis, filamentis circiter 25 mm. longis, antheris ellipsoideis circiter 2 mm. longis apice apiculatis; ovario ubique velutino-puberulo interdum basim versus parce setuloso, breviter stipitato, ovulo solitario, stylo gracili circiter 17 mm. longo inferne puberulo superne glabro.

VITI LEVU: Mba [formerly Nandi]: Vicinity of Tumbenasolo, valley of Namosi Creek, alt. 200-450 m., *Smith* 4502 (A, US), 4627 (A, US) ("yamo"; trees 15-20 m. high, in forest along stream; bud-bracts rich brown); Nandronga & Navosa: Southern slopes of Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, alt. 300-450 m., May 29, 1947, *Smith* 4588 (A TYPE, US) ("yamo"; tree 20 m. high, in dense forest; petals and filaments pure white; ovary pinkish): valley of Singatoka

River, *Greenwood 423B* (A, US) (tree to 23 m. high, in forest along creek; bark gray); Naruku, vicinity of Mbelo, near Vatukarasa, alt. 250 m., *Degener 15317* (A, US) ("yamo"; tree 8 m. high, in forest; timbers used for house-posts). Fiji, without definite locality, *Horne 519* (GH).

The new species is readily distinguished from typical *M. grandiflora* (A. Gray) Scheff. by its copiously puberulent rachis and pedicels and its velutinous-puberulent ovary. An additional, but evanescent, difference is seen in the lateral flower-subtending bracteoles, those of *M. grandiflora* being hispidulous all along the median dorsal line or distally glabrous, whereas those of the new species are tufted-strigose distally and glabrous below. *Maniltoa floribunda* is a frequent component of the comparatively dry forest of southwestern Viti Levu, but it has not yet been noted elsewhere. That the Horne specimen cited above may also have come from this general region is indicated by the fact that he visited the Singatoka valley and the adjacent region toward Nandi (A Year in Fiji, 42. 1881); Horne (op. cit. 260) listed his no. 519 as a probable new species distinct from *Cynometra grandiflora*. The typical form of *M. grandiflora* is not yet known with certainty to occur on Viti Levu.

In discussing *M. grandiflora*, above, I mentioned that one of the three specimens composing *Seemann 138* (GH) is suggestive of *M. floribunda*. The specimen in question, mounted on the upper left portion of the sheet, has inflorescences like those of *M. floribunda*, but the pubescence of its pedicels is more pronounced, minutely hispidulous rather than merely puberulent. Furthermore its leaves are bijugate, as far as seen, and the leaflets are thicker in texture and with a more definitely curved midrib than those of *M. floribunda*. I believe that this part of *Seemann 138*, which comes from either Ovalau or Vanua Levu, represents still another entity in *Maniltoa*, but material for verification is inadequate.

***Maniltoa vestita* sp. nov.**

Arbor ad 20 m. alta ramulis juvenilibus et foliorum petiolis rhachibus petiolulisque minutissime et evanescente puberulis et inflorescentiis exceptis glabra; ramulis teretibus sat crassis rugulosis cinereis lenticellatis, hornotinis subflexuosis; foliis ad 10 cm. longis bijugis vel apicem ramulorum versus unijugis, petiolis subteretibus rugulosis 8–12 mm. longis, rhachi saepe flexuosa, petiolulis inconspicuis rugulosis haud 2 mm. longis; laminis foliolorum subcoriaceis in sicco olivaceis inaequilateraliter oblongo-ellipsoideis, 4–7 cm. longis, 2.5–4 cm. latis, basi latere inferiore rotundatis vel late obtusis superiore gradatim angustatis, apice late obtusis et leviter emarginatis, margine integris et leviter recurvatis, costa subrecta vel paullo curvata utrinque elevata, nervis secundariis utrinsecus 3–6 anastomosantibus cum rete venularum intricato utrinque prominulis vel subimmersis; inflorescentia axillari vel e ramulis defoliatis oriente breviter racemosa 20–25-flora juventute bracteis numerosis involucrata, bracteis papyraceis, maximis suborbiculari-ovatis ad 25 × 20 mm. apice rotundatis dorso copiose ferrugineo-puberulis margine ciliatis mox caducis; rhachi sub anthesi circiter 1 cm. longa pilis ferrugineis 0.3–0.5 mm. longis copiosissime hispidula, bracteolis lateralibus lineari-lanceolatis 2–4 mm. longis dorso

copiose hispidulis; pedicellis obscure striatis sub anthesi 15–20 mm. longis ut rhachi dense hispidulis in receptaculum circiter 2 mm. diametro incrassatis; sepalis 4 sub anthesi reflexis submembranaceis oblongis, 10–13 mm. longis, 3–5 mm. latis, apice obtusis, dorso copiose hispidulo-puberulis; petalis 5 submembranaceis obovato-lanceolatis, 11–14 mm. longis, 2–3 mm. latis, inferne angustatis, apice subacutis; staminibus circiter 40, 1- vel 2-seriatis, filamentis sub anthesi 12–17 mm. longis, antheris ellipsoideo-oblongis circiter 1.5 mm. longis apice obtusis; ovario omnino velutino-hispidulo etiam interdum parce setuloso, breviter stipitato, ovulo solitario, stylo gracili circiter 10 mm. longo distaliter glabro.

VANUA LEVU: Mathuata: Southern slopes of Mt. Numbuiloa, east of Lambasa, alt. 350–500 m., Nov. 3, 1947, *Smith 6442* (A TYPE, US) ("thimbithimbi"; tree 20 m. high, in thin forest on rocky slope; bracts whitish brown; petals, filaments, and style white).

Maniltoa vestita, apparently the most sharply distinct entity of the genus in Fiji, is readily distinguished from its closest ally, *M. floribunda*, described above, by the obvious characters pointed out in my key.

DESMODIUM Desv.

Three weedy species of this genus which have apparently not otherwise been recorded from Fiji in the taxonomic literature are listed below. I am indebted to Dr. Bernice G. Schubert, of the Gray Herbarium, for her verifications of identifications in *Desmodium*.

Desmodium purpureum (Mill.) Fawc. & Rendle, Fl. Jam. 4: 36. 1920.

VITI LEVU: Naitasiri: Central Agricultural Station, on cultivated land, *B. E. Parham 2411* (A) (shrub 2 m. high).

This American species has apparently not previously been recorded as occurring in Fiji.

Desmodium heterocarpum (L.) DC. Prodr. 2: 337. 1825.

VANUA LEVU: Mathuata: Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, alt. 100–200 m., *Smith 6811* (A, US) (shrub 1–2 m. high, naturalized along trail in patches of forest in open rolling country; petals pale blue). TAVEUNI: Vicinity of Somosomo, in gardens, *Gillespie 4774* (A, US) (flowers purple).

Although it has been reported from several Pacific archipelagos, I have found no published record of the occurrence of this widespread species in Fiji. Mr. William Greenwood mentions the species in an unpublished list, indicating that he has also collected it in Fiji.

Desmodium gangeticum (L.) DC. Prodr. 2: 327. 1825.

KANDAVU: Vunisea, *B. E. Parham 2999* (A), *3000* (A).

Apparently this weed has not otherwise been noted from Fiji, although its occurrence has been recorded in Micronesia, the Austral Islands, and on Rarotonga.

DEPARTMENT OF BOTANY,

U. S. NATIONAL MUSEUM,

SMITHSONIAN INSTITUTION.

STUDIES IN THE BORAGINACEAE, XIX

IVAN M. JOHNSTON

CONTENTS

A. NOTEWORTHY SPECIES FROM TROPICAL AMERICA	172
B. <i>Cordia</i> § <i>Gerascanthus</i> IN MEXICO AND CENTRAL AMERICA	179

A. NOTEWORTHY SPECIES FROM TROPICAL AMERICA

Antrophora, gen. nov. *Ehretioidearum*

Calyx 5-partitus, segmentis ovato-orbicularibus valde imbricatis quincuncialibus nempe 2 exterioribus et 3 interioribus. Corolla parva: tubo cylindrico calyce paullo longiore, faucibus haud differentiatibus apertis intus nudis, lobis tubi brevioribus ovato-oblongis imbricatis recurvis. Stamina 5 in faucibus affixa paullo exserta; filamentis brevibus basim versus plus minusve dilatis; antheris erectis medio-affixis sagittato-lanceolatis; lobis antherae a medio segregatis superne collateraliter adnatis rima lateraliter longitudinali utrinque dehiscentibus. Ovarium sub anthesi glabrum ellipsoideum vel obovoideo-ellipsoideum, discum tenuiter patelliformum parvum suffultum. Stylus elongatus simplex lateraliter compressus tandem deciduus; stigmatibus 2 oblongis, apice approximatis vel fortasse subconfluentibus deinde deorsum sub angulo ad 80° abeuntibus, dorso apice compresso styli longitudinaliter affixis. Ovula 4 erecta. Fructus ellipsoideus vel obovoideo-ellipsoideus; exocarpio chartaceo nitido in sicco luteolo; mesocarpio tenui ut videtur exsucco; endocarpio duro in pyrenas 2 biseminatas tarde diviso, extus opaco sublaevo faciebus duobus (dorsali et ventrali) fere a basi usque ad apicem fossula longa conspicua instructo faciebus ad dextram sinistramque supra medium fossula brevi donato, intus loculas fertilis 4 uniseminatas angustas elongatas et loculas steriles 4–5 (2–3 majores) materia spongioso-cellulosa repletas gerente. Semina 4. — Arbor. Folia alterna exstipulata integerrima ovato-elliptica supra punctis albis minutis evidenter obsita. Inflorescentia terminali dichotoma multiramosa ebracteata multiflora foliis dimidio brevior. — Nomen derivatus a *άντρον*, *antrum*, et *q opós*, *fero*, propter loculos steriles fructus.

Antrophora Williamsii, sp. nov.

Arbor ad 10 m. alta; ramulis novellis ad 4 mm. crassis sparse strigosis; petiolo 1–2 cm. longo subtus convexo supra canaliculato; lamina folii subcoriacea ovato-elliptica 6–10 cm. longa 4–6 cm. lata. basi obtusa vel rotunda, apice obtusa vel breviter lateque acuminata, supra in sicco nigrescenti abundantissime minuteque albo-punctata pilis adpressis 0.2–0.8 mm. longis praesertim secus venas et costam inconspicue obsita, subtus in sicco brunnea pilis erectis 0.2–0.6 mm. longis donata tenuiter subvelutina; venis

primariis laminae folii utroque latere costae 8–10 rectis vel laeviter curvatis sub angulo ad 80° abeuntibus, in facie inferiori prominulis; venis secundariis transversis; inflorescentia cymoso-corymbosa 3–6 cm. lata dense multiramosa 1–2 cm. longe pedunculata in statu fructiferi rigida ramulis crassiusculis donata; floribus subsessilibus vel ad 1 mm. longe crasseque pedicellatis; calyce sub anthesi campanulato; lobis erectis valde imbricatis amplis saepe 1.5 mm. longis et 2 mm. latis marginem ciliatam versus plus minusve scariosis, apice obtusis vel rotundis, basi subauriculatis et 1 mm. late affixis, dorso convexis plus minusve strigosis; calyce fructifero explanato accrescenti indurato 5–6 mm. diametro persistenti; corolla glabra, tubo cylindrico 2 mm. longo 1.5 mm. diametro, lobis ca. 1 mm. longis et 0.6 mm. latis recurvis oblongis vel ovato-oblongis apice obtusis vel rotundis basi late affixis; filamentis ca. 0.3 mm. longis ascendentibus rigidulis 0.1–0.2 mm. infra sinus angustos acutos loborum corollae affixis; antheris 0.5 mm. longis in faucibus apertis corollae gestis, basi sagittatis 0.3 mm. latis, apice acutis; ovario subanthesi glabro ellipsoideo ad 1.5 mm. longo in tertiam partem superiorem minutissime abundantissimeque pallido-papillato; stylo 1 mm. longo, lobis oblongis ca. 0.3 mm. longis; fructu glaberrimo ellipsoideo vel ovoideo-ellipsoideo ad 9 mm. longo et 7 mm. crasso paulo supra medium crassiore symmetrico erecto apice cicatrice basis styli parva inconspicua donato.

NICARAGUA: near Matagalpa, dept. Matagalpa, tree to 10 m. along stream, 750 m. alt., Nov. 15, 1946, *L. O. Williams & A. Molina 10960* (TYPE).

The Central American tree here described as *Antrophora* has its closest relative in *Lepidocordia* Ducke, Archiv. Jard. Bot. Rio Janeiro 4: 170, t. 22 (1925), a monotypic genus of the Amazon Valley. Though closely related it is readily distinguished from the southern tree by having a single well-developed style and a four-seeded fruit with a more complicated endocarp.

Antrophora and *Lepidocordia* show similarities in the general form, texture, venation, and disposition of their foliage, and agree very closely in the character and abundance of the minute clusters of mineralized epidermal cells that dot their upper leaf-surfaces. Both genera have tiny glabrous un-appendaged corollas with a tube only barely surpassing the broad, erect, spirally arranged, strongly imbricate sepals. *Antrophora*, however, has distinctly recurving rather than spreading corolla-lobes, a cylindric rather than a slightly ampliate corolla-tube, and very broad and rounded rather than acute ovate sepals. Its very short filaments are also attached very high in the corolla-tube. The inflorescence of *Antrophora* is coarser and more spreading than in *Lepidocordia* and also more regularly dichotomous and persistent.

In *Antrophora* the ovary is terminated by an elongate laterally compressed style. The apex of the style is slightly enlarged and also compressed and is acute in lateral outline. The stigmatic surface is developed along the length of both of the narrow divergent slanting edges of the style-

apex. The stigmas, accordingly, are not free but rather depressed narrow-elongate bodies attached along the entire length of their backs to the edges of the style-apex. The two stigmas, one on each of the slanting edges of the style-apex, are in contact only over the very tip of the style. They usually remain distinct but at times appear to be somewhat confluent. The manner in which the stigmas are borne is utterly different from that in *Lepidocordia*. In the latter genus two tiny elongate stigmas arise directly and independently from the apex of the ovary. No style is developed, a condition unique in the Boraginaceae.

In both *Antrophora* and *Lepidocordia* the fruit has a lustrous, completely glabrous, chartaceous exocarp which at extreme maturity dries, breaks up and shells off to free a large bony endocarp. The mesocarp is thin, only very moderately if at all juicy, but in any case dry and inconspicuous at maturity. The endocarp has a relatively smooth dull surface. This is marred by deep longitudinal furrows on the axial and abaxial sides of the endocarp and usually also by a shorter furrow above the middle of the endocarp on its left and right sides. It is by the deepening and breaking along the axial-abaxial furrows that the endocarp eventually divides in half.

A transverse cross-section of the endocarp of *Antrophora* well below its middle is nearly circular in outline and is divided internally into nearly equal quarter-sectors by narrow bony partitions that meet and fuse at the center. The left and right sectors, slightly smaller than the axial and abaxial ones, each contain two elongate diverging seminiferous locules. Between these latter and near the outer endocarpial wall there is a small sterile cavity. The axial and abaxial sectors, on the other hand, are each occupied by a single large sterile cavity. The curved outer wall of each cavity is abruptly thinned at its midpoint, for here is located the large furrow on the outside of the endocarp.

A transverse cross-section well above the middle of the endocarp reveals a change in structural pattern. The tips of the fertile sectors, which were fused below the middle, are separated above the middle. Furthermore, the small sterile cavity between the seminiferous locules no longer has a bony outer wall but is now the furrow on the upper half of the left and right sides of the endocarp. There is also change in the large axial and abaxial sterile sectors. Above the middle of the fruit there has appeared a narrow arching plate of tissue connecting the sides of opposing fertile sectors. This divides each of the large sterile sectors transversely. Since the fertile sectors have their tips no longer in contact, a cross-section above the middle of the endocarp reveals three cavities along the axial-abaxial diameter. These consist of an hourglass-shaped central cavity and, exterior to it, two large transversely elongate cavities, one just inside of both the axial and abaxial sides of the endocarp. At maturity the endocarp breaks apart along its axial-abaxial diameter, dividing the three sterile cavities exactly in half. Each half of the endocarp is two-seeded.

The endocarp of *Lepidocordia* is morphologically similar to that of

Antrophora, but differs in being smaller and more elongate and in maturing a total of only two seeds. Unlike *Antrophora* it has no small sterile cavity in the fertile sectors or at most has them represented only by furrows on the upper half of the endocarp. The large cavities along the axial-abaxial diameter are smaller, asymmetric, and less clearly developed than in *Antrophora* but function similarly. *Lepidocordia* normally matures not four but only two seeds per fruit. Two of the fertile locules in *Lepidocordia* are imperfectly developed. As a result of this, the cross-sections of the endocarp do not have the bilateral symmetry exhibited by *Antrophora*.

I am unable to give any information regarding the inner structure of the seeds of *Antrophora*. In available material they were apparently unfertilized and shriveled and represented only by empty seed-coats. I feel confident that they will prove to be similar to those of *Lepidocordia*. In the latter genus the seeds have evident endosperm and non-plicate cotyledons.

Although the genera *Antrophora* and *Lepidocordia* have many structures very suggestive of the Heliotropioideae, they seem best assigned to the Ehretioideae. I am not sure that such classification is the most natural, but, whatever the case, it does appear to be practical, since it will allow the continued use of style and stigmas in the delimitation of subfamilies. I have compared *Antrophora* and *Lepidocordia* with members of all the genera assigned to the Ehretioideae. They are obviously different and do not seem to be closely related in that subfamily. On the other hand, in the Heliotropioideae, especially in *Heliotropium* (particularly among species with biseminate nutlets or indehiscent fruit), and in *Tournefortia* (the Andean *Eutournefortia* in particular) one finds much agreement, notably a similar calyx, similar corollas, and similar endocarps. My impression is that *Antrophora* and *Lepidocordia* have closer and more pervading agreement with the Heliotropioideae than with any genus in the Ehretioideae. Indeed, had our genera markedly scorpioid inflorescence-branches and single terete stigmas, I would assign them to the Heliotropioideae with confidence.

The Heliotropioideae consist of two very large, probably artificial genera, *Heliotropium* and *Tournefortia*, and also a remarkable Argentine monotype, *Ixorhoea*. All these plants have a single style that is terminated by a terete stigma. The stigma is variable in size, form, and appendages, and can be simple or highly specialized. It may be conic, truncate-conic, oblong, or rarely subglobular, and may be receptive all over or only in a more or less well-defined band near the base. When differentiated into receptive and non-receptive parts its sterile portion can be various-lobed. In all cases it is radially symmetric and terete at least near the base. Most of the genera of the Ehretioideae have styles that are distinctly lobed or even divided. The two stigmas, generally globose or peltate, terminate the lobes of the style. Among the long-established members of the subfamily only *Rhabdia* has a simple style. Its filiform style is terminated by a minute bilobed subpeltate stigma.

In *Antrophora* there is a single style which bears two downwardly divergent stigmas, one on each of the sloping edges of its flattened, slightly enlarged acute tip. Its stigmas, in arrangement, are unlike those in any genera of the two subfamilies mentioned. The two separate sessile stigmas of *Lepidocordia* are even more aberrant. In both genera, however, the stigmas developed are less discordant in the Ehretioideae than in the Heliotropioideae. There are many reasons for believing that the original Boraginaceae were ehretioid in character and that from them have evolved in divergent lines of specialization the three other subfamilies, the Cordioideae, Heliotropioideae, and Boraginoideae, and perhaps even the modern Hydrophyllaceae also. Perhaps we have in *Antrophora* and *Lepidocordia* conservative remnants of an old group which originated at a time when heliotropioid evolution had developed its characteristic fruit but had not yet greatly modified the simple primitive ehretioid stigmas.

***Cordia hebeclada*, sp. nov.**

Arbor 3–15 m. alta abortu styli staminumve dioica; ramulis dichotomis pilis abundantibus minutissimis molliter vestitis minute velutinis; foliis dimorphis, facie superiore laminae virida subscabra pilis minutis rigidis laxe vel valde adpressis 0.1–0.2 mm. longis 0.1–0.3 mm. distantibus obsita, facie inferiore graciliter abundanterque reticulata molliter minuteque velutina secus costam et reticulum prominulum nervorum pilis 0.1–0.3 mm. longis gracilibus saepe curvatis abundantibus donata; foliis majoribus elliptico-lanceolatis vel ovatis 15–25 cm. longis 7–15 cm. latis 1–2 cm. longe petiolatis, apice plus minusve acuminatis, basi rotundis utroque latere costae nerviis 6–10 donatis; foliis minoribus 5-plo rarioribus suborbicularibus vel orbiculari-ovatis saepe 8–10 cm. longis, apice rotundis vel obtusis, basi saepe truncatis vel subcordatis; inflorescentia corymbosa dichotoma 1–3 dm. diametro multiflora. Flores masculi: calyce cupulato 3–4.5 mm. longo 1.8–2.5 (–3.5) mm. crasso, extus minute denseque pubescentibus, intus strigosis, lobis inaequalibus acutis 0.5–1.2 mm. longis; corolla alba 6–8 mm. longa, lobis oblongis recurvatis 3–4 mm. longis 1.5–2 mm. latis, tubo 3–4 mm. longo basi ca. 2 mm. diametro apice ad 3 mm. crasso; filamentis ca. 4 mm. longis basi villosis; antheris ca. 1.2 mm. longis et 1 mm. latis; ovario abortivo glabro obovoideo 1.5 mm. longo infra medium tumescenti, stylo 1.5–2 mm. longo. Flores feminei: calyce subcylindraco 2.5–3 mm. longo 1.5–1.9 mm. crasso, lobis inaequalibus acutis 0.5–0.7 mm. longis; corolla alba 3.5–4 mm. longa, lobis oblongis recurvatis 1.5–2 mm. longis, tubo ad 2 mm. longo; filamentis staminum abortivorum 0.5–0.9 mm. longis glabris vel basim versus sparsissime villosis, antheris ca. 0.3 mm. longis; ovario glabro ovoideo; stylo exserto 3.5–4 mm. longo bifido; drupa glabra albescenti depresso globosa, endocarpio depresso-ovoideo valde rugoso ad 10 mm. longo et 8 mm. lato oblique ascendenti; calyce fructifero explanato 4–5 mm. diametro.

COLOMBIA: Villavicencio, tree 3 m., 1939, Killip 34349 (TYPE, Gray Herb.).

ECUADOR: hills near Guayaquil, large tree, 1933, Mille 838 A-B (G);

Cerro de Lantana Guayaquil, Dec. 1845, *Jameson 507* (Brit. Mus.); 1 km. west of Guayaquil, tree 20 ft., *E. L. Little 6435* (U. S. Forest Service); San Lorenzo, prov. Esmeraldas, tree 20–34 ft., *Little 6287* and *6345* (U. S. Forest Service); Rio Amarillo above Portovelo, prov. E. Oro, tree 25 ft., *Steyermark 54074* (Chicago).

PERU: Morales near Tarapoto, upper Rio Huallaga, 1929, *L. Williams 5676* (G).

BOLIVIA: forests of Buenavista, dept. Santa Cruz, tree 10–15 m., Oct. 26 and 31, 1924, *Steinbach 6633* (G); dept. Santa Cruz, prov. Sara, Oct. 5, 1916, *Steinbach 2933* (G); Campos region, Buenavista, 6–12 m. tall, Dec. 9, 1924, *Steinbach 6734* (G).

A *Cordia* having regular dichotomous branching, dimorphic leaves, and strongly heterostyled flowers unisexual by abortion. It is evidently a member of the group of *C. toqueve* Aubl. and probably most closely related to *C. panamensis* Riley. In size and form of leaves, structure and size of flowers, and form and structure of the glabrous drupe, it agrees with *C. panamensis*. It differs, however, in indument, in its regular dichotomous branching, and in its more southern distribution. The twigs, calyx, and lower leaf-surface in *C. panamensis* are clothed with stiffish hairs, their indument being stiffish velvety or even bristly. In *C. hebeclada*, on the other hand, the indument consists of a great abundance of minute short hairs that give a thin downy cover that is uniform and very soft to the touch. On old specimens it becomes *cafe au lait* or fawn-color and not brownish or fulvous as common in *C. panamensis*.

The branching of *C. panamensis*, cf. Johnston, *Sargentia* 8: 257 (1949), is not regularly dichotomous. In the present species the branching has the regularity of that in *C. bicolor* DC., cf. Johnston, l.c. 255. It would accordingly give the tree a flat top and so justify the vernacular *Quitazol*, which Little, *Caribbean Forester* 9: 269 (1948), sub "*C. panamensis*," reports is applied to it in Ecuador. *Cordia panamensis* ranges from southernmost Mexico to Panama, near the coast in northern Colombia, and on the islands of Trinidad and Tobago in the West Indies. In contrast, *C. hebeclada* is known from low altitudes along the east side of the Andes in eastern Colombia, Peru and Bolivia, and also near the coast in Ecuador.

Cordia Brownei (Friesen), comb. nov.

Montjolya Brownei Friesen, Bull. Soc. Bot. Genève II, 24: 180 (1933). — based on *Varronia curassavica* sensu Swartz, Obs. Bot. 88 (1791), a plant of Jamaica.

GRAND CAYMAN: east end of the island, 1938, *W. King 126* (Brit. Mus.).

JAMAICA: Bath, 1928, *Orcutt 2005* (Brit. Mus.); without locality, *Wm. Wright* (Brit. Mus.), *J. Wolle* (G) and *Marsh* (G).

The specific name I have accepted was launched in a very casual manner. The binomial *Montjolya Brownei* n. sp. was merely listed, without description or discussion, as the correct name for the Jamaican plant long ago, in 1790, described by Swartz as "*Varronia curassavica*." The Latin description given by Swartz, however, is adequate for the recognition of the

species concerned and sufficient to give legal standing to the name that von Friesen proposed. The type of *M. Brownei* is a Jamaican specimen collected by Swartz. The species is almost certainly named for Patrick Browne, well known for his botanical work in Jamaica. The name *Cordia Brownii* DC., Prodr. 9: 499 (1845), has a different derivation and a different spelling and does not invalidate the name *C. Brownei*. The former is named for Robert Brown and is an Australian plant probably synonymous with *C. dichotoma* Forst.

The present Jamaican plant is a close relative and perhaps only a well-marked geographic variety of *C. portoricensis* Spreng (= *C. angustifolia* R. & S., 1819; not Roxb., 1814) of Porto Rico and the Virgin Islands. It differs in its broader and firmer leaf-blades, which are copiously hairy beneath. Though the most westerly ranging of the West Indian spicate *Cordias*, it seems readily separable from any relatives in Mexico and Central America. In Jamaica it can be confused only with *C. jamaicensis* but is readily distinguished by its narrower, more elongate leaves hairy on the lower surface. Its calyx is distinctly strigose rather than nearly glabrous, and is much less accrescent, in the fruiting state embracing only the lower half of the drupe and not nearly covering it. *Cordia Brownei* appears to be an erect bushy shrub. *Cordia jamaicensis*, on the other hand, is more or less clambering. Grisebach, Fl. Brit. W. I. 480 (1861), seems to have treated *C. Brownei* as one of the forms of "*C. cylindrostachya*," a mistake followed by many more recent botanists.

Cordia jamaicensis, sp. nov.

Frutex subscandens ad 6 m. alta; ramulis foliosis saepe 1–3 dm. longis 2–3 mm. crassis pilis 0.2–0.3 mm. longis rigidis adpressis incurvis e basi incrassatis orientibus sparse obsitis; foliis saepe lanceo-ovatis vel late lanceolatis 2.5–10 cm. longis 1.2–4.5 cm. latis, basi acutis vel obtusis, apice acutis, margine evidente sed minute sinuato-dentatis (dentibus ad 1 mm. altis), supra glabris sub lente minute albo-verruculosis, subtus granuliferis secus costam et nervos majoris pilis minutis incurvatis sparse donatis alibi glabris, nervis supra impressis, utroque latere costae 5–7(–9) sub angulo 45° abeuntibus; petiolo 3–13 mm. longo, parte infima 1–2 mm. longa foliis delapsis persistenti lignescenti; inflorescentia spicata multiflora sub anthesi clavata mox anguste cylindrica 8–10 mm. crassa 2–4 cm. longa; pedunculo terminali vel non rariter extra-axillari 3–9 cm. longo, calyce sessili in alabastro obovoideo apiculato, sub anthesi 3–4 mm. longo cupulato secus marginem loborum deltoideorum 1 mm. longorum sparse pubescenti alibi glabro granulis resiniferis obsito; corolla alba extus glabra, tubo 4 mm. longo gradatim ampliato basi 2 mm. diametro, supra 4 mm. crasso, intus medium versus dense villosa, limbo reflexo ca. 1 cm. lato, lobis ovatis crispis margine erosodentatis; filamentis medium versus tubi corollae affixis inaequalibus 0.5–1.5 mm. longis, antheris 0.8 mm. longis; ovario glabro globoso stylo 3.5 mm. longo gesto; ramulis styli clavatis; drupa rubra calyce persistenti accrescenti fere inclusa; endocarpio oblique globoso-ovoideo 3.5–4 mm. longo ad 3–3.5 mm. crasso irregulariter tuberculato.

JAMAICA: Glasgow near Troy, 1200 m. alt., climbing to 20 ft., 1917, *Harris 12634* (G); near Troy, 1400 m., shrub 8–10 ft., 1906, *Harris 9456* (Brit. Mus.); near Troy, 2000 ft. alt., rocky bank, shrub 6 ft., 1904, *Harris 8732* (Gray Herb., type; Brit. Mus., isotype); Knowsley Park, Devon, 2548 ft., tall shrub, fruit red, 1908, *H. A. Wood* (Brit. Mus.); Giddy Hall, St. Elizabeth, 1926, *Iris Maxwell* (Brit. Mus.); without locality, *J. Wolle* (G).

A member of the section *Varronia* having distinctly spicate terminal or extra-axillary inflorescences. It is distinguished at a glance from other West Indian, Mexican and Central American congeners. It has passed usually as a phase of *C. cylindrostachya*, a very different shrub with axillary spikes and a native of northwest South America. In having rather broad leaves and the calyces apiculate in the bud it bears some superficial resemblance to *C. martinicensis* Jacq. and is probably the basis of Grisebach's, Fl. Brit. W. I. 481 (1861), report of the latter species from Jamaica. In fact, however, *C. jamaicensis* seems only very generally related to that species of the Lesser Antilles.

The larger leaves are usually 2.5–3 times as long as broad, moderately thin in texture, minutely dotted and glabrous above, and only obscurely pubescent and in fact seemingly glabrous beneath. The calyx in the bud has rudimentary free lobe-tips, and though not very pronouncedly so, is evidently puckered up at the apex. At maturity the drupe is closely ensheathed by the accrescent bag-like calyx with connivent lobes, only the apical portion of the fruit being uncovered. The texture and scanty pubescence of the leaves and the short-tipped calyx-lobes quickly distinguish *C. jamaicensis* from *C. martinicensis*. The broad thinnish leaves and the calyx much ensheathing the fruit readily separate *C. jamaicensis* from other spicate *Cordias* of the West Indies and the adjacent continent.

B. CORDIA § GERASCANTHUS IN MEXICO AND CENTRAL AMERICA

The section *Gerascanthus* is one of the very well marked groups in its genus. Its species are exclusively American and about equally represented north and south of the Equator. Most of its members have rather limited geographic distribution, and only one, *C. alliodora*, is really wide-ranging.

The fruit, unlike that in most *Cordias*, is not a drupe. It is ellipsoidal or sausage-shaped and has fibrous chartaceous walls enclosing a single seed. At the apex it is usually crowned by the persistent disk-like cartilaginous base of the style. This thin-walled, dry, single-seeded fruit develops inside a cylindric calyx, where it is ensheathed by the tube of the persisting marcescent corolla. At maturity it commonly drops to the ground still associated with calyx and corolla.

The corolla is usually white at anthesis but afterwards turns brown, dries without shriveling, and, changed in color but unaltered in form, persists for several months while the fruit is maturing. In at least some species, e.g. *C. alliodora* and *C. Gerascanthus*, its spreading lobes may act as a parachute and so aid in dissemination. Although the flowers are

characteristically pentamerous it is not uncommon to encounter in the inflorescences of this group at least occasional flowers having corollas with six or even seven lobes. The sinus between the corolla-lobes are usually plicate. In *C. alliodora* they are acute and very narrow, but in most species they are truncate and commonly at least 1 mm. broad at the base. Heterostyly is well marked in most species of the section, the corollas on a given plant having either their stamens or their styles, but not both, conspicuously exerted from the funnelform throat. Among the species in our area only *C. alliodora* has a single type of corolla, one with a short style and long exerted stamens.

The calyx in the section is usually elongate and more or less cylindrical. It is traversed longitudinally by at least ten ribs and is usually tough and firm in texture. Among our species only *C. megalantha* is exceptional in these respects. Its calyx is firm-chartaceous and perhaps best described not as ribbed but rather as longitudinally lineate-striate. In most species the calyx-lobes are small and triangular and separated by V-shaped sinus. They may be all free, five in number and equal in size, or, failing to separate, be united in two to four unequal groups. The calyx-lobes of *C. alliodora* and *C. igualensis*, however, are somewhat different. The calyx appears to have a truncate upper edge upon which are borne minute, well-separated lobes that are scarcely more than apical prolongations of five of the calyx-ribs. These minute lobes, or teeth, are separated not by V-shaped but by broad flat sinus.

The species bloom during the dry season, and most of them are reported as producing flowers in great abundance. The individual trees can be a mass of bloom and very conspicuous and decorative. This is particularly true of the Mexican *C. Gerascanthus*, *C. Nelsonii*, *C. globulifera*, *C. morelosana*, and *C. sonorae*, which are leafless or nearly so when in full flower. The timber produced by members of the section *Gerascanthus* appears to be of good quality. Most of the species are reported to be a source of wood esteemed locally for such purposes as carpentry, furniture, turned objects, handles, etc.

KEY TO THE SPECIES

Corolla-lobes with sides straight and parallel or nearly so, usually oblong and with a truncate or retuse tip.

Plant with abundant stellate hairs, usually myrmecophilous; flowers not heterostyled, sinus of corolla-lobes acute.....1. *C. alliodora*.

Plant with no stellate hairs, not myrmecophilous; flowers heterostyled; sinus of corolla-lobes usually truncate at base.

Indument of calyx thin, chiefly of minute short hairs not obscuring the 10 ribs of the calyx.....2. *C. Gerascanthus*.

Indument of calyx velvety tomentose, of abundant slender elongate hairs densely clothing and obscuring the ribs of the calyx.

Calyx 8-10 mm. long, short and stout; corolla-lobes 8 mm. long, almost as broad as long.....3. *C. Nelsonii*.

Calyx 9-13 mm. long, elongate; corolla-lobes 8-12 mm. long, evidently longer than broad.....4. *C. globulifera*.

Corolla-lobes ovate to suborbicular, not oblong nor with noticeably elongate straight and parallel lateral margins.

Lobes of corolla triangular-ovate, broadest near the base and gradually contracted towards the usually blunted apex.5. *C. megalantha*.

Lobes of corolla rounded, semicircular to transversely elliptic, not at all pointed.

Calyx 7-8 mm. long, subtruncate, the lobes minute, inconspicuous and separated by sinus several times their width. .6. *C. igualensis*.

Calyx 10 mm. long or more, with triangular lobes separated by V-shaped sinus.

Indument of calyx conspicuous, velvety or coarsely strigose, with hairs 0.5-1.2 mm. long.

Lower leaf-surface arachnoid-tomentose, the felty indument eventually more or less deciduous.7. *C. Guerkeana*.

Lower leaf-surface not at all tomentose.

Leaves elliptic, less than twice as long as broad, dull and scabrous above, beneath bearing short stiff spreading usually curved hairs along the prominent veins and much branched veinlets.8. *C. morelosana*.

Leaves elliptic to lanceolate, at least twice as long as broad, somewhat lustrous and nearly glabrous above, beneath glabrate or bearing only fine soft hairs, the veins and veinlets not forming a prominent reticulum.9. *C. sonora*.

Indument of calyx of abundant minute hairs, usually black tomentulose or puberulent, coarse hairs if also present less than 0.3 mm. long.

Leaf-blades 3-4 times as long as the petiole; calyx 4-5 mm. thick above the middle, its ribs narrow, high and acute, clothed only with minute black tomentulum, bearing no coarse hairs; filaments glabrous.10. *C. gracilipes*.

Leaf-blades 6-25 times as long as the petiole; calyx 2-3.5 mm. thick, cylindric, the ribs broad and usually longitudinally sulcate; filaments hairy near base.

Calyx 13-14 mm. long, scantily puberulent or nearly glabrous; corolla 28-31 mm. long; leaf-blade smooth, thin, elongate; petiole 10-22 mm. long, its length only 1/3 to 1/2 the width of the leaf-blade; disk beneath the ovary glabrous.11. *C. colimensis*.

Calyx 10-12 mm. long, minutely black tomentulose and scantily strigulose; corolla 24-27 mm. long; leaf-blade firm, prominently veined; petiole 7-10 mm. long, its length usually 1/4 to 1/8 the width of the blade; disk beneath the ovary usually bearing some hairs.12. *C. tinifolia*.

1. *Cordia alliodora* (R. & P.) Oken, All. Naturgeschichte, Bot. 2²: 1098 (1841).

Cerdana alliodora R. & P. Fl. Peruv. 2: 47, t. 184 (1799).—type from Peru.

Cordia consanguinea Klotzsch ex Chodat, Bull. Soc. Bot. Genève sér. 2, 12: 211 (1921). — Herbarium name associated with material from Guatemala collected by Friedrichsthal.

A species widely distributed in Central America. In Mexico it extends northward at low altitudes along the Pacific coast to middle Sinaloa and along the Caribbean lowlands north into southern Vera Cruz and adjacent Chiapas. In the West Indies it is native on most of the islands from Trinidad north to eastern Cuba. Curiously, it is not native in western Cuba nor in Jamaica.

In the past the name of the species has been cited as "*Cordia alliodora* (R. & P.) Cham." That combination was made by DeCandolle, Prodr. 9: 472 (1845) who incorrectly attributed it to Chamisso. Oken, however, made the combination at an earlier date and he, rather than Chamisso, must be cited as authority for it.

The tree flowers early in the dry season while well clad with foliage. Its masses of white flowers begin to attract attention generally during December in Mexico and a month or so later in southern Central America. Unlike other species in our area *C. alliodora* does not have heterostylis flowers. Its flowers all have the stamens protruding well beyond the only shortly exerted style. A distinctive feature of the plant is its myrmecophily, cf. Wheeler, Bull. Mus. Compar. Zoology, Harvard 90: 9-41 (1942). The leafy twigs towards their apex, and frequently even the axis of the inflorescence, develop irregular swellings that serve as ant domatia.

2. *Cordia Gerascanthus* L. Syst. ed. 10, 936 (1759); Johnston, Contr. Gray Herb. 73: 77 (1924). — Based on Jamaican plants.

Gerascanthus foliis ovato-oblongis, utrinque productis racemis terminalibus. — Browne, Nat. Hist. Jamaica 1: 170, t. 29, f. 3 (1756).

Cerdana Gerasacanthus (L.) Moldenke, Phytologia 1: 16 (1933).

Cordia geraschanthoides HBK., Nov. Gen. et Sp. 3: 69 (1818); Ramon de la Sagra, Fl. Cubana 4: t. 59bis (1853). — type from Cuba.

Cordia bracteata DC., Prodr. 9: 472 (1845). — type from near Havana. la Sagra 3.

Gerascanthus lanceolatus J. S. Presl, Wseob. Rostl. 2: 1103 (1846), in part. — a mixture of *C. alliodora* and *C. Gerascanthus*.

Cordia Langlassei Loesener, in Fedde, Repert. 12: 240 (1913). — type from Rio Coyuguilla, Guerrero, Langlasse 834.

Cordia Rothschuhii Loesener, Bot. Jahrb. 60: 368 (1926). — type from between Esquipulos and San Dionysio, dept. Matagalpa, Nicaragua, Rothschuh 462.

GUATEMALA: near Gualán, Record & Kuylen 115 (G).

HONDURAS: near Tela, Standley 53119 (G).

YUCATAN: road to Tepakaam, Jan. 15, 1895, Millspaugh 89 (G); Isamal, Jan. 14, 1895, Millspaugh 89 (G); Calotmul, Gaumer 2160, 2161 & 2438 (G); Sitalpeck, Gaumer 23217 (G); San Anselmo, Gaumer 2439 (G); Buena Vista Xbac, Gaumer 1066 (G).

GUERRERO: banks of Rio Coyuguilla, tree 12-15 m., fl. white, Feb. 6, 1899, Langlasse 834 (G, ISOTYPE).

Known from Mexico (Guerrero and Yucatan), British Honduras, eastern

Guatemala and Honduras, and from west-central Nicaragua. In the West Indies it is a well-known tree on Jamaica, Isle of Pines and Cuba.

This readily defined species has developed minor races in various parts of its total geographic range. West Indian trees usually flower while the tree is in leaf, whereas the continental ones come into flower after the foliage is shed, early in the dry season. Continental plants also tend to differ from the West Indian in having slightly smaller leaves which average broadest above the middle rather than below the middle, and in usually having short stiff hairs on the calyx. Jamaican plants usually have perceptibly larger leaves and flowers than those from Cuba. Yucatan material differs from that of Guatemala and western Mexico in having glabrous filaments and smaller flowers. The plant of western Mexico (*C. Langlassei*) is distinguished by having the corolla-lobes not exactly oblong with parallel margins, but rather perceptibly narrowed from the base outwards.

The plant usually flowers from January into March and bears maturing fruit enclosed by calyx and brown marcescent corollas from February into May. The flowers are markedly heterostyled.

The tree is known as Spanish Elm in Jamaica and as *Baria*, *Baria negra*, or *Baria prieta* in Cuba. On the mainland the following names are applied to it: *Laurel negro*, *Bohonche*, *Bojon*, *Baria*, and *Barillo*.

3. *Cordia Nelsonii*, sp. nov.

Arbor; ramulis pilis minutis adpressis obsitis; foliis ellipticis 2.5–4 cm. longis 14–20 mm. latis scabris pilis numerosis brevibus rigidis adpressis vel adpresso-ascendentibus obsitis, utrinque acutis, 2–5 mm. longe petiolatis, supra viridis costa et nerviis laeviter impressis ornatis, subtus pallidioribus costa et nerviis prominulis donatis; inflorescentia apice ramulis defoliatis ante foliorum novarum evolutionem prodita umbellato-corymbosa ca. 5 cm. diametro, rhache subnullo vel ad 15 mm. longo simplici pilis ad 0.5 mm. longis vestito; pedicellis gracilibus 2–6 mm. longis; calyce sub anthesi 8–10 mm. longo cylindrico ca. 4 mm. crasso (fructifero ad 5 mm. crasso), pilis griseis rectis 0.5–1 mm. longis ascendentibus subvelutinis, lobis triangularibus ca. 1.5 mm. longis, costis 10 propter indumentum inconspicuis; corolla 21 mm. longa glaberrima; limbo 21 mm. diametro; lobis oblongis 8 mm. longis ca. 7.5 mm. latis, marginibus lateralibus subparallelis rectis, apice obtusis vel emarginatis, basi ima abrupte angustatis et late affixis, sinibus basi ad 1 mm. latis; filamentis ca. 7 mm. supra basim tubi affixis 7–10 mm. longis glabris, antheris 2–2.5 mm. longis; stylo medium versus longitudini filamentum attingenti; fructu ellipsoideo 5–6 mm. longo 3.5–4 mm. crasso glabro apice disco cartilagineo basis styli coronato.

MEXICO: La Salada, 40 mi. south of Uruapan, Michoacan, March 15–22, 1903, *E. W. Nelson 6924* (TYPE, Gray Herb.).

Related to *C. morelosana*, from which it differs in its short stout calyx, rectangular corolla-lobes, and small acute leaves. The species is no doubt heterostyled like its relative. The type represents the short-styled form.

4. *Cordia globulifera*, sp. nov.

Arbor ad 10 m. alta; ramulis sparse inconspicueque strigosis; foliis ignotis; inflorescentia apice ramulis defoliatis ante foliorum novarum evolutionem prodita multiflora globosa 5–7 cm. diametro, rhache abortu crasso 0.1–0.5 mm. longo pilis mollibus nigrescentibus dense vestito bracteis ca. 1 mm. latis et 5 mm. longis donato; calyce sessili vel rare ad 3 mm. longe pedicellato 9–13 mm. longo 2.5–3.5(–4.5) mm. crasso velutino pilis gracilibus erectis vel ascendentibus 0.5–1.2 mm. longis dense vestito propter indumentum obscure costato, lobis saepe inaequalibus 3–5 triangularibus vel ovatis 1–2 mm. longis; corolla 20–30 mm. longa alba, limbo 25 mm. diametro; lobis oblongis 8–12 mm. longis 6–8 mm. latis, apice rotundis rare emarginatis, marginibus lateralibus rectis subparallelis, sinibus basi 0.8–1.5 mm. latis plicatis, tubo 5–8 mm. longo medium versus 1–1.5 mm. crasso, faucibus 13–18 mm. diametro; filamentis 6–8 mm. longis glabris vel basi sparsissime strigosis 7–11 mm. supra basim tubi corollae affixis; antheris 2 mm. longis; stylo glabro filamentos superanti; ovario glabro 1 mm. longo quam disco crasso glabro saepe latiore; fructu ignoto.

MEXICO: Acapulco, Guerrero, tree on hillside, 15 ft. tall, trunk 6–8 in. thick, 1895, *Palmer 573* (TYPE, Gray Herb.).

A relative of *C. morelosana*, from which it differs in having narrower, very elongate corolla-lobes and a more slender calyx with less well developed lobes. Also unlike *C. morelosana*, its twigs have appressed rather than spreading hairs. The type collection appears to be the long-styled form of corolla. Foliage and fruit of the species are unknown.

5. *Cordia megalantha* Blake, Proc. Biol. Soc. Washington 36: 200 (1923). — a renaming of *C. macrantha* Blake (1922), not Chodat (1921).

Cordia macrantha Blake, Contr. U. S. Nat. Herb. 24: 19 (1922). — type from Quebradas, dept. Izabal, Guatemala, *Blake 7498*.

GUATEMALA: Quebradas, dept. Izabal, tree 10 m., dry hillside, May 18, 1919, *Blake 7498* (G, ISOTYPE); lower Rio Motagua, large tree, March 6, 1927, *Kuylén 147* (G).

A very distinct species known only from low altitudes in eastern Guatemala. Its glabrous calyx is much less firm in texture than usual in *Gerasanthus* and its ribbing is very much less pronounced. The very broad low ribs may be deeply and broadly longitudinally sulcate. The calyx accordingly may appear to be 20-ribbed or at times merely striate rather than ribbed. In the bud it is tipped by a short apical prolongation. It opens to form two unequal triangular lobes 3–4 mm. long which becomes spreading or somewhat reflexed. The corolla-lobes are also unusual. They are 11–13 mm. long and 9–11 mm. broad at or near the base. Their lateral margins are straight and converge towards the acute or blunted tip of the lobe. The two collections studied have short styles.

6. *Cordia igualensis* Bartlett, Contr. Gray Herb. 36: 632 (1909). — type from Iguala, Guerrero, *Pringle 13912*.

MEXICO: Iguala Canon near Iguala, Guerrero, Dec. 26, 1906, *Pringle*

13912 (G, TYPE); Acatitlan, dist. Temascaltepec, Mexico, in churchyard, Jan. 20, 1933, *Hinton 3176* (G).

Distinctive of this species is its short cylindric calyx, 7–8 mm. long and 3–4 mm. thick, which is truncate above and bears five subequal, minute, widely separate teeth 0.5 mm. long or less. The plant probably has general relations with *C. tinifolia* Willd. The two collections studied have long filaments and only very shortly exerted style. The species apparently comes into flower around the beginning of the New Year.

7. *Cordia Guerkeana* Loesener, Verhand. Bot. Ver. Brandenburg 55: 186 (1913). — type from near Totolapam, Oaxaca, *Seler 1636*.

MEXICO: cañada above Totolapam, Jan. 3, 1896, *Seler 1636* (G, ISOTYPE); between San Carlos and Plantamisto, Oaxaca, Dec. 1842, *Liebmann 12729* (G).

Known only from the watershed of the Rio Tehuantepec in southern Oaxaca. The two specimens seen are from plants apparently not long in full bloom. They bear some old leaves but give evidence of having shed most of their foliage. The species, like *C. sonorae* and *C. morelosana*, is probably leafless or nearly so when it comes into flower early in the dry season. The type has a style shortly exerted and much surpassed by the filaments. Very distinctive of the species is the thin felty arachnoid-tomentose indument which clothes the lower surface of its leaves.

8. *Cordia morelosana* Standley, Contr. U. S. Nat. Herb. 23: 1220 (1927). — type from Cuernavaca, Morelos, *Pringle 8205*.

MEXICO: Michoacan: Coalcoman, *Hinton 12951* and *13611* (G); Huerto del Barillo, *Langlasse 39* (G); Huetama to San Lucas, *Hinton 5702* (G). Guerrero: Calavera, *Hinton 10034* (G); Placeras, *Hinton 9981* & *10046* (G); 15 mi. northeast of Taxco, *Frye 3142* (G); near Huajintlan, *Abbott 108* (G). Mexico: Nanchititlan, dist. Temascaltepec, *Hinton 3122* (G). Morelos: Cuernavaca, *Pringle 7670* (G) and *8205* (G, ISOTYPE).

This very fine species is practically confined to the Rio Balsa watershed, where it has been collected between altitudes of 300 to 1500 m. Flowering occurs from January to May but seems to be most abundant from mid-February to mid-April. Most trees are leafless when in bloom. The species is very markedly heterostylic. The type is the short-styled form. The following vernaculars have been applied to the tree: *Cherive*, *Cherare*, *Chiraire* and *Palo Prieto*.

9. *Cordia sonorae* Rose, Contr. U. S. Nat. Herb. 1: 106, *t. 9* (1891). — type from Alamos, Sonora, *Palmer 376*.

Cordia Palmeri Rose, Contr. U. S. Nat. Herb. 1: *tab. 9* (1891), not *Wats.* (1889). — a tentative name and homonym for the species eventually published as *C. sonorae*.

MEXICO: Sonora: Las Durasnillas, 1892, *Brandege* (G); Tesopaco, Rio Mayo, *Gentry 3031* (G); Alamos, 1890, *Palmer 376* (G, ISOTYPE); Navojoa, 1910, *Rose, Standley & Russell 12963* (G). Chihuahua: south

wall of Batopilas barranca, 1946, *Hewitt 107* (G). Sinaloa: San Blas, *Rose, Standley & Russell 13235* (G). Nayarit: Maria Madre Island, *Nelson 4207* (G) and *Mason 1740* (G).

A very well marked species ranging from northern Sinaloa north to central Sonora and eastward, in the Rio Mayo watershed, into westernmost Chihuahua. It also occurs in the Tres Marias Islands. It is reported that the tree is extremely decorative when in bloom. White flowers in great profusion are produced on branches bare or nearly bare of leaves, usually sometime between late March and early May. Heterostyly is well marked in the species. The type collection represents the short-styled flowers. The tree appears to be well known under the name *Palo de Aste*.

10. *Cordia gracilipes*, sp. nov.

Arbor 10 m. alta; ramulis 2–2.5 mm. crassis glabris; foliis lanceolatis vel obovatis medium versus vel ultra medium latioribus 5–9 cm. longis 2.5–4.5 cm. latis 1.5–3 cm. longe petiolatis, basi acutis, apice acutis vel obtusis et breviter acuminatis, supra viridibus minute abundanterque verruculosis, subtus opacis pallidioribus costa et nerviis prominulis evidenter donatis secus costam pilis ca. 0.5–0.8 mm. longis inconspicuis donatis alibi glabris; inflorescentia terminali 1–6 cm. longe pedunculata multiflora, pilis abundantibus fuscis dense vestita demum subglabrescenti, ramulis pluribus apice congeste ramosis; calyce 10–11 mm. longo clavato-cylindrico (apicem versus 4–5 mm. crasso) prominenter 10-costato tomentulo nigro tenui vestito, costis angustis apice longitudinaliter leviterque sulcatis, lobis triangularibus 3–5; corolla alba, 24 mm. longa, extus supra medium pilis sparsis inconspicuis adpressis donata, intus glaberrima, limbo ad 30 mm. diametro; lobis 8 mm. longis 10–11 mm. latis medium versus vel paulo supra medium latioribus apice rotundis marginibus lateralibus rectis, sinibus plicatis basi truncatis et ad 1 mm. latis, tubo ad 6 mm. longo, faucibus ca. 10 mm. profundis infundibuliformibus; filamentis glabris apice tubi affixis 8–9 mm. longis, antheris oblongis 2 mm. longis; ovario glabro, disco cupulato margine ciliato; fructu ignoto.

MEXICO: Campo Morado to Pueblo Viejo, Guerrero, tree 10 m. tall on rocky hillside, fl. white, Nov. 9, 1939, *Hinton 14826* (TYPE, Gray Herb.).

A well-marked species perhaps most closely related to *C. tiniifolia* Willd., but very different in its smaller long-petiolate subglabrous leaves and coarse, very acutely and prominently ribbed calyx. If the species is heterostyled the type is the short-styled form.

11. *Cordia colimensis*, sp. nov.

Arbor; ramulis gracilibus glabris; foliis glabris, lamina lanceolata 6–13 cm. longa 2–4 cm. lata 1–2 cm. longe petiolata basi acuta, apice acuta vel subattenuata, supra viridi, subtus pallidior; inflorescentia apice ramulorum foliatorum gesta multiflora globosa vel umbellata ca. 7 cm. diametro, rhache valde reducta congesta breviterque ramosa 1–5 mm. diametro 0–5 mm. longe pedunculata pilis brunnescentibus brevibus curvatis dense vestita; calyce cylindrico glabrato vel inconspicue puberulenta 13–14

mm. longo 3–3.5 mm. crasso 10-costato (costis longitudinaliter sulcatis), lobis 3–5 parvis 1.5–2 mm. longis; corolla 28–31 mm. longa, limbo 27–30 mm. diametro, lobis 7–8 mm. longis 10–11 mm. latis medium versus latioribus apice rotundis extus secus costas pilis adpressis gracilibus sparsissime donatis, sinibus basi 1–1.5 mm. latis, tubo ca. 10 mm. longo, faucibus 13 mm. longis late infundibuliformibus; filamentis 10–11 mm. supra basim tubi corollae affixis 15–16 mm. longis basim versus minute villulosis alibi glabris, antheris ca. 3.5 mm. longis; ovario glabro; disco ca. 1 mm. diametro cupulato glabro; fructu ignoto.

MEXICO: Manzanillo, Colima, Dec. 1–31, 1890, *Palmer 898* (TYPE, Gray Herb.).

A relative of *C. tinifolia* Willd., differing in its much larger flowers, glabrate calyx, and glabrate elongate long-petiolate leaves. The type has a short style and elongate, well-exserted stamens. It is the short-styled form if the species proves to be heterostyled.

12. *Cordia tinifolia* Willd. ex R. & S., Syst. 4: 800 (1819); Cham., Linnaea 8: 122 (1833). — type given as from South America but actually from Acapulco.

Cordia Geraschanthus sensu HBK., Nov. Gen. et Sp. 3: 69 (1818). — a plant from Acapulco, Mexico, and part of the same collection as that described as *C. tinifolia* Willd.

Cordia linifolia Willd. ex Cham., Linnaea 4: 472 (1829). — lapsus calami.

MEXICO: Acapulco, Guerrero, tree 15–45 ft. tall, trunk ca. 1 ft. thick, found in bottomlands, native and much planted about dwellings, free bloomer, flowers rather dull white, Oct. 1894 to March 1895, *Palmer 236* (G); without locality [Acapulco], *ex herb. Willd.* (G, fragment of TYPE); Colochuca, Guerrero, bottomland, 50 ft. alt., tree 5–6 m., fl. white, Jan. 6, 1899, *Langlasse 732* (G).

The species is heterostylic and its type is representative of the long-styled form. Flowering specimens have been collected between January and April. From the few collections available it would appear that the species is confined to bottomlands along the coast of Guerrero.

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NOTEWORTHY SPECIES FROM MEXICO AND ADJACENT UNITED STATES, III

IVAN M. JOHNSTON

Drymaria subumbellata, sp. nov.

Planta glaberrima perennis fruticulosa 1–2 dm. alta e radice crassa lignosa palari oriens; caulibus numerosis ascendentibus vel decumbentibus plus minusve glaucescentibus ascenderet ramosis basim versus lignosis 1–3 mm. crassis, internodiis 1.5–6 (saepe 2–3) cm. longis; foliis exstipulatis linearibus carnosulis pallidulis 0.5–1 mm. latis 2–4 cm. longis compressis vel valde revolutis et subteretibus, superioribus paulo reductis; inflorescentia terminali cymoso-umbellata multiflora 2–2.5 cm. diametro saepissime ca. 6 cm. longe pedunculata, bracteis numerosis congestis lanceolatis 3–4 mm. longis donata; pedicellis sub anthesi 5 mm. longis ascendentibus, fructiferis 5–10 mm. longis divergentibus vel reflexis; floribus in alabastro maturo anguste ovoideis acutis ca. 5 mm. longis 2–3 mm. crassis; sepalis late ovatis ad 5 mm. longis 3.5 mm. latis conspicue albomarginatis apice obtusis; petalis 5 albis 4 mm. longis, ungue 3 mm. longo 1.5 mm. lato infra medium latiore margine minute denticulato summum ad apicem 0.8 mm. lato truncato laciniis 0.5–1 mm. longas lateralibus quam interioribus longiores gerenti; filamentis 3.5–4 mm. longis subulatis; antheris medio-affixis 1 mm. longis 0.3 mm. latis; stylo 1 mm. longo; capsula globoso-ovoides 4–6 mm. crassa; seminibus dorse hirsutis.

COAHUILA: near Tanque La Luz, south end of Cañada Oscuro, confined to gypsum beds on steep escarpment, plant sprawling or ascending, glaucous, fleshy; corolla white, Aug. 26, 1941, *Johnston 8489* (TYPE).

Related to *D. elata* Johnston, another gypsophilous species of Coahuila, but readily separable because of the larger flowers and fruit, the pointed flower buds, and the larger bracts on the congested cymose, rather than globose, umbellate inflorescence. Three fruticulose *Drymarias* having slender leaves 2 cm. long or longer are now known from northern Mexico. They are all confined to Coahuila and all are gypsophilous. Their relationship is shown in the following key.

Inflorescence a large, very loosely branched cyme; petals with the unlobed basal portion having a flabellate blade which is contracted downward into a claw-like attachment. *D. suffruticosa* Wats.
Inflorescence congested; petals with their unlobed basal portion oblong-ovate, broadest below the middle and broadly attached.

Flower buds globose, rounded at the apex, 4 mm. long; inflorescence a globose umbel with bracts less than 1 mm. long. *D. elata* Johnston.

Flower buds ovoid, pointed, 5 mm. long; inflorescence a congested sub-umbellate cyme with bracts 3–4 mm. long. *D. subumbellata*, sp. nov.

***Drymaria lyropetala* var. *coahuilana*, var. nov.**

A varietate typica differt foliis majoribus 5–15 (haud 3–6) mm. longis; bracteis scariosis inflorescentiae 2–3.5 (haud 0.5–1) mm. longis.

COAHUILA: 1 m. south of Hermanas, common locally on gypseous soil, *Johnston 7064*; Hermanas, *Marsh 1571*; west base of Picacho del Fuste, gypsum bed on mountainside, common locally and restricted to gypsum, *Johnston 8352*; valley between La Vibora and Matrimonio Viejo, confined to gypsum, *Johnston 9347*; 2 km. south of Santa Elena, Sierra de las Cruces, gypsum ridge, *Johnston 567* (TYPE); gypsum flat near Santa Elena, *Johnston & Muller 241*.

When *D. lyropetala* Johnston, Jour. Arnold Arb. 21: 68 (1940), was described, it was noted that available specimens from San Luis Potosi were obviously less robust than those from Coahuila. This difference is still evident in more recent collections from Coahuila and can be recognized as a varietal difference. The plants of San Luis Potosi and Coahuila are marked gypsophiles and where I have observed them are always confined to nearly pure gypsum. Floral structures of the northern and southern plants show no differences. Only glabrous plants have been seen from the south. The plants of Coahuila, however, have herbage varying from completely glabrous to stipitate-glandular in varying degrees.

***Mahonia Muelleri*, sp. nov.**

Frutex; ramulis robustis 2–4 mm. crassis apicem versus bracteis coriaceis triangularibus mucronatis imbricatis 6 mm. latis 3 mm. altis donatis; foliis pinnatis 5–9 (saepe 7)-foliolatis; foliolis ellipticis vel ovato-ellipticis cano-viridibus opacis rigidiusculis subtus pallidioribus, basi obtusis vel subtruncatis, margine minute spinuloso-dentatis (dentibus utrinque saepissime 3 spinam 1–1.5 mm. longam gerentibus), apice obtusis vel late acutis; foliolis jugi infimi 6–10 mm. longis basi petioli valde (2–3 mm.) approximatis, ceteris subaequalibus 1–2 cm. longis 7–12 mm. latis 8–10 mm. distantibus; foliola terminali saepissime 3–8 mm. longe petiolulata quam ceteris haud vel vix majore; floribus ignotis; inflorescentia fructiferi cernua laxissime racemosa 3–5-flora, rhache 15–20 mm. longa, pedicellis 5–10 mm. longis gracilibus rectis, bracteis cuneato-lanceolatis secundis 1–2.5 mm. longis; bacca subglobosa, maturitate sicca inflata 6–7 mm. diametro; seminibus 6–10.

NUEVO LEON: road from Pablillo to Cieneguillas, about 15 miles southwest of Galeana, very abundant, a subdominant in lower pinyon belt, June 15, 1934, *C. H. & M. T. Mueller 803* (TYPE).

A plant of the pinyon belt on the eastern slope of the Sierra Madre Oriental of northeastern Mexico. It is most closely related to *M. Fremontii* (Torr.) Fedde, which ranges in the deserts of western United States from western Colorado and northwestern New Mexico westward into California and thence south into Baja California. *Mahonia Fremontii* has pallid, thick, very rigid, coarsely dentate-lobulate leaflets with strongly undulating surfaces. *Mahonia Muelleri* differs in its much thinner, less pallid, very much less rigid leaflets that have nearly flat surfaces and only

minutely toothed margins. The large area in New Mexico, Texas and adjacent Mexico separating the ranges of *M. Fremontii* and *M. Muellieri* is occupied by *M. haematocarpa*. This is closely related to *M. Fremontii* and in northern Arizona and New Mexico even intergrades with it. In the eastern portions of its range, where it occurs closest to the area of *M. Muellieri*, *M. haematocarpa* becomes relatively stable and a readily delimited species. Its rigid, undulate, pallid, coarsely toothed, elongate, lanceolate leaflets, with the terminal one frequently sessile and larger than the others, separate it readily from *M. Muellieri*.

Mahonia moranensis (R. & S.), comb. nov.

Berberis moranensis R. & S. Syst. 7: 17 (1829).

Berberis pinnata HBK. Nov. Gen. et Sp. 5: 71, t. 434 (1821); non Lag. (1803).

This appears to be the most common and widely distributed *Mahonia* of central Mexico. In the past such authors as Fedde, Bot. Jahrb. 31: 86 (1901) and Standley, Contr. U. S. Nat. Herb. 23: 272 (1922), have identified it with the plants of the Pacific Coast of Canada and United States described as *Berberis pinnata* Lag. (1803) and *Mahonia fascicularis* DC. (1821) upon the basis of specimens from Monterey, California, and Nutka, British Columbia. The name *Berberis moranensis* is essentially a renaming of *B. pinnata* HBK., the latter being a late homonym of *B. pinnata* Lag. The species concerned is confined to Mexico. The type is from the vicinity of Moran, or Real de Moran, in the mountains of Hidalgo.

Mahonia trifoliolata (Moric.) Fedde, Bot. Jahrb. 31: 96 (1901).

Berberis trifoliolata Moric. Pl. Nouv. Amer. 113, t. 69 (1841).—Inter Laredo et Bejar, *Berlandier*.

Berberis ilicifolia Scheele, Linnaea 21: 591 (1848).—An Felsen bei Neubraunfels, *Römer*.

Berberis Roemeriana Scheele, Linnaea 22: 154 and 352 (1849).—A substitute for *B. ilicifolia* Scheele (1848), non Forster (1789).

TEXAS: Austin, Travis Co., 1872, *Hall* 10; south of Austin, east of Country Club, 1926, *Bogush*; New Braunfels, Comal Co., *Lindheimer* 322, 575 and 661; San Antonio, Bexar Co., 1853, *Thurber*; near Rio Frio between Laredo and San Antonio, Frio Co., March 1828, *Berlandier* 1437 (ISOTYPE); Goliad, *Palmer* 9131; northeast of Beeville, Bee Co., *Wiegand* 599; Corpus Christi, Nueces Co., *Heller* 1384; Kleberg Co., *Sinclair*; near San Diego, Duval Co., March 1887, *Sargent*; Hebronville, Jim Hogg Co., *Hanson* 341.

Typical *M. trifoliolata* is confined to southern Texas, south of Austin and Corpus Christi. Although it is to be expected in northernmost Tamaulipas, no collections from Mexico have been seen. The type was collected near the crossing of the Rio Frio on the old road between Laredo and San Antonio in present-day Frio County, Texas.

Mahonia trifoliolata var. *glauca*, var. nov.

A varietate typica differt foliis opacis glaucis minutissime abundantissime papillatis.

TEXAS: Gamble Ranch, Armstrong Co., *Palmer* 13910; Lubbock, *Demaree* 7492; near Camp Barkeley, Taylor Co., *Tolstead* 6880; Comanche Peak, Hood Co., *Palmer* 6544; San Saba, *Reverchon* 18; south of Tarpley, northern Medina Co., *McVaugh* 7671; Feodora, Terrell Co., *Palmer* 33576; Chisos Mts., Brewster Co., *Moore & Steyermark* 3291; Davis Mts., Presidio Co., *Moore & Steyermark* 3121; 11 mi. north of Van Horn, Culberson Co., *Waterfall* 4613.

ARIZONA: Santa Catalina Mts., Pima Co., March 1881, *Vasey*.

NUEVO LEON: 39 mi. north of Monterrey, *Frye* 2440; Monterrey, *Pringle* 13725; 15 mi. southwest of Galeana, *Mueller* 460.

SAN LUIS POTOSI: between Doctor Arroyo and Matchuala, *Nelson* 4523; Charcas, *Lundell* 5151.

COAHUILA: Saltillo, *Palmer* 139; Parras, *Purpus* 1031; Santa Elena, Sierra de las Cruces, *Stewart* 2249; Sierra Hechiceros, *Stewart* 478.

CHIHUAHUA: hills near Chihuahua, 1885, *Pringle* 261 (TYPE of var. *glauca*); Plomosas Mine, *Hewitt* 103.

Mahonia trifoliolata as it has been traditionally accepted breaks up readily into two recognizable geographic varieties. That including the typical form of the species is confined to southern Texas and is characterized by green, somewhat lustrous leaves. The most widely distributed variety, var. *glauca*, is characterized by opaque, distinctly glaucous foliage and occupies a large area in northern and western Texas and south into Mexico. Its range is in contact with that of typical *M. trifoliolata* only along the Balcone Escarpment from Austin southward. Whereas typical *M. trifoliolata* is largely confined to Tertiary formations on the Coastal Plain, the variety *glauca* is associated with the more elevated country further inland where Cretaceous limestones predominate. The opaque glaucous foliage, the distinctive feature of var. *glauca*, is the result of excessive development of minute papillae on the leaf surfaces. These papillae are pallid, usually very elongate and very crowded, and are discernible individually only under high magnification. They appear to be formed largely of a hard white wax, since they shrink considerably or even vanish after exposure to boiling water.

The oldest name of the pallid plant is *Berberis trifoliata* Hartweg ex Lindley, Bot. Reg. 27: miscl. p. 68 (Sept. 1841) and op. cit. 31: t. 10 (1845), based upon cultivated plants grown from seeds collected by Hartweg at Hacienda del Espiritu Santo, San Luis Potosi, on the road between the cities of Zacatecas and San Luis Potosi. The name *Mahonia trifoliata* (Hartw.) Lavallé applies to it also.

Amyris cordata, sp. nov.

Frutex glabra; foliis alternis trifoliolatis; petiolo 8–15 mm. longo subtereti; foliolis costa et reticulo venarum evidenter ornatis margine crenatis apice acutis vel obtusis; foliolis lateralibus 2–9 mm. longe petiolulatis 15–32 mm. longis 11–28 mm. latis ovatis basi saepe cordatis sed interdum obtusis; foliolo terminali 4–20 mm. longe petiolulato ovato 20–34 mm. longo 14–30 mm. lato quam duobus lateralibus aliquantum majore, basi saepe cordato vel rariter rotundato; inflorescentia terminali paniculata

laxa 3–6 cm. longa 2–4 cm. lata 5–10 mm. longe pedunculata; pedicellis 0.6–1.3 mm. longis; sepalis infra medium latioribus obtusis ca. 1 mm. latis et 0.8 mm. longis; petalis et staminibus ignotis; ovario glabro stylam 0.1–0.3 mm. longum plus minusve cylindricam gerentibus; fructu globoso laevi ad 5 mm. diametro.

TAMAULIPAS: Cerro Ladinas near San Jose, Sierra de San Carlos, limestone ledges, July 11, 1930, *H. H. Bartlett 10242* (TYPE); Cerro de los Armadillos, near San Jose, Sierra de San Carlos, limestone ledges, July 10, 1930, *Bartlett 10211*.

A well-marked species which is evidently related to *A. texana* (Buckley) Wilson. It is readily distinguished from its relative by its leaflets, which are not only larger but cordate rather than lanceolate in outline, with the lateral pair distinctly petiolulate rather than sessile. Its flowers appear to be appreciably larger than those of its relative. *Amyris texana* ranges from southern Texas south into northern Tamaulipas. It also occurs in the Sierra San Carlos, an isolated mountain mass on the coastal plain of northern Tamaulipas, in which *A. cordata* is perhaps endemic.

Tetraclea subinclusa, sp. nov.

Herba perennis humilis pilis minutis retrorsis abundanter donata; caulibus laxe ascendentibus vel prostratis 5–15 cm. longis sparsissime vel haud ramosis e radice palari valida profunda orientibus, internodiis 5–22 mm. longis; foliis ovatis vel lanceolatis integerrimis saepe 5–10 mm. longis, lamina 1–2 cm. longa 5–18 mm. lata infra medium latiore deinde sursum apicem acutum vel rotundum versus gradatim attenuata et deorsum basim obtusum vel acutum versus in petiolum 2–6 mm. longum abrupte vel gradatim contracta; facie inferiori laminae superiore modice pallidiori costa saepe albida et nervis paucis inconspicuis ornata; pedicellis 1–3 mm. longis; lobis calycis subanthesi 6–8 mm. longis cuneatis; corolla flava vel purpurascens conspicua, tubo 16–17 mm. longo 1.5–2 mm. crasso quam calyce duplo longiore extus glabro intus praesertim supra medium plus minusve villuloso; lobis corollae obovatis 6–7 mm. longis 2.5–3.5 mm. latis; filamentis perbreviter exsertis rectis 6.5–9 mm. longis subglabris vel infra medium villulosis, 2.5–3 mm. sub apice tubi corollae affixis, apice e tubo corollae 2–5 mm. longe exsertis, medium vel rariter apicem versus lobum erectum superiorem corollae attingentibus; antheris oblongis 1.2–1.9 mm. longis 0.5–0.9 mm. latis; nuculis 4–5 mm. longis.

COAHUILA: Sierra del Pino, near mouth of southern canyon, about limestone ledges on hillside, prostrate, corolla yellow, *Johnston & Muller 741*; south end of Cañada Oscuro, near Tanque La Luz, on limestone beds between gypsum strata on escarpment, local, corolla reddish purple, *Johnston 8504* (TYPE); Cañon del Agua Chica near Las Delicias, limestone crevices, scarce, odor bad, flower yellow, *Stewart 2830*.

Although evidently related to the polymorphic *T. Coulteri* Gray, the present plant differs in its very large corollas in which the tube is about twice as long as the calyx and the stamens are straight and are exerted less than 5 mm. from the corolla tube and not beyond the usually erect

dorsal corolla lobes. In Coahuila the common form of the genus is that described as *T. angustifolia* Woot. & Standl., a loosely branched usually erect plant with narrow toothed leaves and small corollas with much curved long-protruded stamens. The proposed species is most like typical *T. Coulteri* of Hidalgo, San Luis Potosi and Tamaulipas, which also has broad entire leaves but a looser growth habit and very much smaller corollas with well exerted stamens.

Maurandya coccinea, sp. nov.

Herba ut videtur perennis pilis erectis glanduliferis 0.1–0.5 mm. longis obsita; caulibus sinuosis 1–2 mm. crassis ut videtur 1–3 mm. longis; internodiis 2–10 mm. longis; foliis alternis; petiolis gracilibus haud contortis 15–24 mm. longis; lamina carnosula 9–15 mm. longis 12–18 mm. latis breviter lateque 5-lobata vel grosse obtuseque 5-dentata, basi truncata vel subcordata, apice obtusa; costâ et nerviis obscuris; floribus in axillis foliorum solitariis; pedicello gracili 4–7 mm. longo, fructifero recurvato; calyce sub anthesi ca. 10 mm. longo, lobis herbaceis 6–8 mm. longis ad 4 mm. latis subinaequalibus paulo supra medium latioribus apice obtusiusculis; calyce fructifero ad 13 mm. longo, lobis ad 10 mm. longis; corolla rubra ca. 3 cm. longa subcylindrica; lobis obovatis, duobus dorsalibus erectis in alabastro exterioribus 4.5–5 mm. longis basim versus 1.5–2 mm. longe connatis, tribus ventralibus reflexis 5 mm. longis; faucibus apertis 3.4–4 mm. diametro palato vel plicis nullo modo instructis; tubo 2.5 cm. longo, basi obliquo nullo modo gibboso 3–4 mm. crasso, ca. 8–10 mm. supra basim angustissimo et 2–2.5 mm. crasso deinde sursum gradatim ampliato, 3–5 mm. infra lobum crassissimo et 3.5–5 mm. diametro, extus sparse viscido-villuloso, intus in tertiam partem inferiorem praesertim secus insertionis filamentis pilis obesis albis 0.1–0.25 mm. longis dense obsito alibi pilis perbrevis valde obesis brunnescentibus sparse donato; filamentis 4 conspicue exsertis anguste ligulatis 0.2–0.4 mm. latis ad 3 cm. longis ca. 6 mm. supra basim corollae affixis, basim versus pilis albis obesis dense obsitis, apicem versus glandulis brevissime stipitatis sparse donatis; antheris semicircularibus ca. 1 mm. diametro, loculis tandem divaricatis discretis glabris; staminodio nullo; capsula ad 10 mm. crassa glabrata irregulariter dehiscenti; seminibus numerosis ca. 2 mm. longis et 1 mm. latis stramineis mox brunnescentibus alis duobus crassis ca. 0.2 mm. latis plus minusve parallelis circumdatis apice (et non rariter base) birostratis.

COAHUILA: mountains at east side of Valle de Acatita, 2 km. northeast of Rancho del Coyote, crevices on slope, scarce, flowers red, Sept. 24, 1942, Robert M. Stewart 2742 (TYPE).

A very distinct addition to the known species of the genus *Maurandya*. It is especially noteworthy for its unusual seeds, for its markedly exerted stamens, and for the absence of either folds or palate in the throat of its red subtubular corollas. The stamens may project beyond the erect upper corolla-lobes for as much as 8 mm. The oblong body of the seed is practically hidden by two pairs of cartilaginous longitudinal outgrowths, cuneate in cross-section, that usually unite over the ends of the seed body

forming a parallel pair of thick acute-edged "wings" around the long axis of the seed. Between these "wings" there is another smaller development of cartilage which becomes conspicuous only at one end of the seed, where, from either side, it projects 0.5 mm. as a compound beak. This tissue forming the beak appears to be homologous to that which makes the thin simple wing on the seed of other *Maurandya* species. The plant is so distinct that its precise relationship with previously known species is uncertain. I can only suggest that it has affinities with *M. flaviflora* Johnston, *M. acerifolia* Pennell, and *M. petrophila* Cov. & Morton, all cliff plants like *M. coccinea* and curiously also local species and likewise recently discovered members of the genus.

The genus *Maurandya* has been submerged in the genus *Asarina* Miller by Pennell, Proc. Philadelphia Acad. 99: 173 (1947). In his amplified *Asarina* Pennell has included not only thirteen species of *Maurandya* from Mexico and adjacent United States, but also two species of *Antirrhinum* from California (*A. filipes* Gray and *A. stricta* H. & A.), as well as the type species of *Asarina*, *Antirrhinum Asarina* L., of southern France and Spain. The generic characters for this heterogeneous assemblage are found in a symmetrical, completely dehiscent capsule and the prevalence of a twining growth-habit. The fact that some of the species have the familiar snapdragon type of corolla (with the throat closed by a bulging lower lip) and others do not is dismissed as unimportant. The results, I believe, are unnatural. The type of *Asarina*, *Antirrhinum Asarina* of southwestern Europe, has vegetative characters suggestive of *Maurandya*, but its flowers are very different from those of that genus, being remarkably similar in size, appearance and structure to those of the familiar garden snapdragon, as is well shown in the following illustrations: Bot. Mag. 23: t. 902 (1805); Loudon, Ladies Fl. Gard., Ornamental Perennials 2: t. 84 (1844); Coste, Fl. France 3: 9 (1906); and Bonnier, Fl. Compl. France 8: t. 442 (1926). The very numerous species and the very great diversity in habit displayed by *Antirrhinum* and its relatives in southern Europe point to that area as the most active evolutionary center for the Antirrhineae. *Antirrhinum Asarina* seems to be no more than one of its well-marked products. The peculiarities of the species are only intensifications of evolutionary trends exhibited in various degrees and combinations by the other species of the genus in southern Europe and northern Africa. To look to Mexico for its ancestors seems unnecessary and incorrect.

The familiar *Antirrhinum* corolla is found among the Californian members of that genus and particularly in *A. filipes* and *A. stricta*. I am utterly unable to believe that these latter species are more closely related to the Mexican *Maurandya* than to the other species of Californian and European *Antirrhinum* with which they have been traditionally associated. Their corolla form, I am convinced, has phyletic significance and is more accurately indicative of their relationship than the fruit structures and vague habit similarities stressed by Pennell. *Maurandya* has corollas with an open throat. Only one species, *M. antirrhinoides*, has a somewhat

bulged palate. All others have the open throat, bearing at most merely modest folds or lines of hairs that act as guides for insect visitors. Though at times I have wondered if *M. antirrhinoides* was deserving of generic segregation, despite its somewhat swollen palate, it is without doubt more closely related to the other *Maurandya*s than to any other genus, and certainly more so than to any species that have been generally assigned to *Antirrhinum*.

If corolla structures, rather than fruit structures, continue to be emphasized in the classification of the Antirrhineae, the genus *Maurandya* remains readily defined in its usual sense. Since it is a practicable, a useful, and, most important, a natural concept — a native American genus that originated and differentiated in Mexico, I believe that it is deserving of continued recognition and that most botanists will be satisfied to maintain it.

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STUDIES IN THE THEACEAE, XIX THE GENERA ARCHYTAEA AND PLOIARIUM

CLARENCE E. KOBUSKI

Archytaea Martius (1826) and *Ploiarium* Korthals (1840) are two small and closely related genera of the Theaceae which have been alternately combined and separated by various workers during the past century. In fact, these two genera seem to have appeared far more frequently in literature than they have in the vascula of the collectors!

With *Bonnetia* they make up the tribe Bonnetieae and as such are located at the very beginning of the family in most herbaria.

Geographically these two are far removed. *Archytaea* is confined to the mainland of South America, while *Ploiarium* occupies the islands and mainland of the Malaysian area of the Old World.

Archytaea was first recognized and described by Martius (Nov. Gen. et Sp. 1: 116) in 1826. The author selected the name in memory of Archytas (ca. 428–346 B.C.), a philosopher and scientist of the Greek city Tarentum located in southern Italy.

It appears that Archytas was best known for his mathematical contributions, since he was the first to draw up a methodical treatment of mechanics with the aid of geometry and to distinguish harmonic from arithmetical and geometrical progressions. In biology he observed that the parts of animals and plants were in general rounded in form. He was also a military leader, having been elected seven times as commander of the army. Under his leadership Tarentum fought with varying success against the Messapii, Lucania and even Syracuse. One of his greatest claims to fame and glory (albeit reflected) is that he has been remembered as an intimate friend of Plato.

When introducing the genus, Martius described a single species, *A. triflora*, from the Amazonas region of Brazil. This species, after a hundred years, is still seldom collected and little known. A second and better-known species, *A. multiflora*, was described by Bentham in 1843.

In the meantime (1840), Korthals (Verh. Nat. Gesch. Bot., ed. Temminck 135) described a new genus *Ploiarium* from Borneo. This generic name was derived from the diminutive of the Greek word πλοῖον (*ploion*), meaning boat or canoe, and refers to the shape of the locules of the capsules after dehiscence. A single species, *P. elegans*, was introduced by Korthals.

These two genera retained their distinct status only fifteen years. In 1855 Choisy in his study of the family combined the two and reduced *Ploiarium* to synonymy under the earlier described *Archytaea*. Following Choisy's lead, Bentham and Hooker (1862) in Gen. Pl. 1: 188 continued the combination of the two genera under a single name, thus unwittingly

influencing contemporary and future authors by their stand. Workers on the Asiatic flora, evidently not sufficiently interested in American genera to compare the materials, followed the lead of Choisy and Bentham & Hooker. Szyszyłowicz continued the practice in his work on the Theaceae for *Das Natürliche Pflanzenfamilien* in 1893. Dalla Torre & Harms (1901) listed *Ploiarium* as a synonym in their *Genera Siphonogamarum*, and so it continued until 1925, when Melchior in the second edition of *Das Natürliche Pflanzenfamilien* (21: 151. 1925) reinstated *Ploiarium* as a separate genus.

I agree with Melchior and most of the present-day workers in the Malaysian flora that the two genera should remain distinct. To students of the American flora the name made little difference, since *Archytaea*, the accepted name, applied originally to an American plant.

There are several points of difference, major points — and consistent in the genera. The following chart indicates these points.

<i>Ploiarium</i>	<i>Archytaea</i>
Flowers solitary, axillary.	Flowers in three- to many-flowered inflorescences, never solitary; inflorescence axillary.
Calyx deciduous.	Calyx persistent.
Stamens deciduous.	Stamens persistent.
Styles five, free to the base.	Style one, entire its whole length.
Nutrient tissue fleshy.	Nutrient tissue none.
Distribution: Malaysia.	Distribution: South America.

From observation of the inflorescence it appears that *Ploiarium*, with its simple axillary flower, is more highly advanced evolutionally than *Archytaea*, with its three- to many-flowered inflorescence. The distribution of the genera is of importance. *Ploiarium* not only is confined to the tropical islands and the peninsular mainland of Malaysia, but, judging from collectors' notes and the comments of those who have seen it growing, it prefers the low altitudes and usually inhabits the seashore. *Archytaea*, on the other hand, prefers the higher altitudes and sandstone soil of Roraima, Duida, and Pteri-tepuí.

ARCHYTAEA

Archytaea Martius, Nov. Gen. Sp. 1: 116. 1826. — Cambessedes in Mém. Mus. Hist. Nat. Paris 16: 410. 1828. — G. Don, Gen. Syst. 1: 572. 1831. — Meisner, Pl. Vasc. Gen. 1: 41. 1836. — Endlicher, Gen. Pl. 1020. 1840. — Walpers, Repert. 1: 373. 1842; Ann. Bot. Syst. 1: 121. 1848. — Bentham in Hooker, London Jour. Bot. 2: 363. 1843. — Tulasne in Ann. Sci. Nat. Bot. III, 8: 340. 1847. — Choisy in Mém. Soc. Phys. Hist. Nat. Genève 14: 160 (Mém. Ternstr. 72). 1855, in part. — Bentham & Hooker f., Gen. Pl. 1: 188. 1862, in part. — Baillon, Hist. Pl. 4: 259. 1873, in part. — Wawra in Fl. Bras. 12(1): 327. 1886, in part. — Szyszyłowicz in Nat. Pflanzenfam. III.

6: 181. 1893, in part. — Dalla Torre & Harms, Gen. Siphon. 317. 1901, in part. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 151. 1925. — Lemée, Dict. Pl. Phan. 1: 363. 1929, in part. — Kobuski in Bull. Torrey Bot. Club 75: 412. 1948.

Flowers hermaphroditic, 3- ∞ in inflorescence. Sepals 5, glabrous, imbricate, persistent, thick, concave, subequal. Petals 5, free, deciduous, glabrous. Glands 5, alternate with petals. Stamens ∞ , persistent; filaments pentadelphous, closely joined at the lower end, free, thread-like above; anthers two-celled, minute, with wide connective, versatile. Ovary glabrous, 5-loculate, the locules multiovulate; style simple, persistent with a punctate stigma. Capsule 5-celled, dehiscing septicidally, the margin wavy, the columnella persistent. Seeds ∞ , linear, imbricate.

Evergreen trees or shrubs. Leaves alternate, coriaceous, congested at the apices of the branchlets. Inflorescence axillary, near apex; peduncles long, anapitous, increasing in diameter toward the apex; pedicels 1-bracteate at base, 2-bracteolate midway to calyx.

TYPE SPECIES: *Archytæa triflora* Martius.

KEY TO THE SPECIES

Peduncles subcapitate, many-flowered; bracts foliaceous, with large glands (usually two) along the margin.....*A. multiflora*.

Peduncles 3-flowered; bracts not foliaceous and without glands...*A. triflora*.

Archytæa multiflora Bentham in Hooker, London Jour. Bot. 2: 363.

1843. — Choisy in Mém. Soc. Phys. Hist. Nat. Genève 14: 160

(Mém. Ternstr. 72). 1855. — Wawra in Martius, Fl. Bras. 12(1):

329. 1886. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 181. 1893. —

Melchior in Nat. Pflanzenfam. ed. 2, 21: 151. 1925. — Kobuski in

Bull. Torrey Bot. Club 75: 412. 1948.

Tree up to 10 m. high, occasionally a shrub, glabrous throughout; branchlets thick, terete, dark gray, roughened by conspicuous leaf-scars. Leaves sessile, coriaceous, congested at the apex of the branchlets, alternate, obovate, 5-7 cm. long, 2-2.5 cm. wide, acute to acuminate at the apex, tapering at the base, dark green and shiny above, pale green and dull beneath, the margin entire, red, the midrib prominent, wider at the base, tapering toward the apex, the veins prominent on both surfaces, 16 or more pairs, at first running parallel to and as part of the midrib, then branching off, anastomosing, and sweeping upward near the margin in the form of submarginal veins. Flowers few to several, congested at the end of the peduncle, telescoped in the form of a small head; peduncle axillary, varying in length up to 10 cm., anapitous, increasing in diameter toward the apex; pedicels short, terete, 5 mm. (more or less) long, subtended by a single bract; bract foliaceous in texture and outline, varying in length, usually ca. 2 cm. long, with a single gland midway on each side; bracteoles 2, opposite, at varying distances along the pedicel. Sepals 5, imbricate, thick, subequal, broadly ovate to subrotund, varying from

green to deep red, or green with red margins, ca. 5 mm. long and 4 mm. wide, the margins lightly membranaceous; petals 5, ovate to obovate, rose to white in varying degrees of color combination, 12-13 mm. long, 4-6 mm. wide; glands 5, alternating with petals, less than 1 mm. long; stamens numerous, pentadelphous, red, ca. 10 mm. long, joined compactly along the lower half, the upper half free: the anthers measuring ca. 1 mm. across, with the cells and the connective of about equal measurement; ovary obovoid, rounded or ovoid, ca. 4 mm. diam., 5-angled, 5-celled, with numerous minute ovules, the style entire, ca. 12 mm. long, red, the stigma punctate. Capsule somewhat rounded, ca. 7-8 mm. diam., septicidal, the seeds very numerous, linear, closely packed in series, ca. 2 mm. long.

BRITISH GUIANA: Roraima, *R. Schomburgk* 876 (G).—Kaieteur Savannah, side of small gully, *T. G. Tutin* 624 (US), Aug. 28, 1933 (tree 35 ft. with dark gray, fissured bark; young leaves waxy white; flowers pink, the filaments pink, the anthers deep red and the style yellow).—Kaieteur Savannah, rare in white sand from conglomerate and sandstone, *B. Maguire & D. B. Fanshawe* 23108 (A, NY), April 30, 1944 (small tree to 4 m. high, 10 cm. diam., leaves leathery, brittle, red-margined, crowded at the branch ends, of high phyllotaxy; flowers rose-pink, the stamens rose-pink, the peduncles gray and the bracts waxy).—Along the Arubaru River (Kako tributary), Mazaruni drainage, near Haiamatipu Mt., alt. ca. 2000 ft., *A. S. Pinkus* 175 (NY, US), Feb. 4, 1939 (tree 15 ft. high, the trunk 6 in. diam.; petals and filaments pink, the anthers brownish).

VENEZUELA: Bolivar, vicinity of "Misia Kathy Camp" on mesa between Ptari-tepuí and Sororopan-tepuí, margin of swamp, alt. 1600 m., *J. A. Steyermark* 60241 (Ch), Nov. 15-17, 1944 (shrub 10 ft.; leaves deep green above, dull paler green below; petals pinkish white with orchid-pink along upper edge of one side, in bud rose-pink, the calyx grass-green with pink at the apex).—Bolivar, Mt. Roraima, southwest-facing slopes bordered by hilly savannah, alt. ca. 1100 m., *J. A. Steyermark* 58603 (Ch), Sept. 25, 1944 (shrub 5-15 ft.; leaves coriaceous, dark green and shiny above, pale green suffused with lavender below; petals white within with pink borders, rose without on margin with salmon-pink over other part, the sepals dull red and green).—Mt. Roraima district, vicinity of Arabupu, on swamp soil, alt. 4200 ft., *A. S. Pinkus* 48 (Ch, G, NY, US), Nov. 18, 1938 (tree ca. 12 ft. high; sepals deep red, yellowish distally, the petals, stamens and style pink).—Bolivar, Gran Sabana, Salvas de galeria del río Uarí, *F. Tamayo* 3127 (US), 3129 (US), March 1946 (small tree ca. 2 m. high; flowers rose).—Summit of Mt. Duida, hillsides and flat ground at Central Camp, alt. 4800 ft., *G. H. H. Tate* 535 (NY), 1034 (NY), Dec. 1928 (bushy tree with pink flowers).—Bolivar, Ptari-tepuí, southeast-facing slopes, shrubby, dry rocky open slopes above "Rocky Swamp," alt. ca. 1600 m., *J. A. Steyermark* 59969 (Ch), Nov. 1944 (shrub 5-8 ft.; leaves coriaceous, dark green and shiny above, pale green below; peduncles pale green; bracts rich green with rose margins; sepals pale green with pale rose tips; petals dull rose).

This species is characterized by an inflorescence of several flowers and chiefly on this character is separated from the following species, *A. triflora* Martius.

Like the majority of species in the Theaceae which enjoy a wide distribution, considerable variation may be found in most characters. This variation is especially noticeable in the inflorescence. In some instances the flowers at the end of the peduncle appear congested into a tight head, while in other cases they are considerably more open. This congestion is due both to the variation in the length of the pedicel and the number of flowers. In *Maguire & Fanshawe 23108* the pedicels measure as much as 12 mm. in length.

The size and shape of the bracts vary considerably on single specimens. On the whole, however, even though varying in size, they are usually the same shape as the leaves of the specimen. An interesting character of the bract is the single (rarely two) large gland found midway along each side of the margin. This appears to be quite consistent in this species but apparently lacking in *A. triflora*.

The bracteoles, more readily distinguished on the flowers of the more open inflorescences, are usually two in number and opposite. Their position along the pedicel varies but they are usually found midway along the pedicel.

The leaves of this species vary in width and the acuteness of the apex. Although all leaves are generally obovate and acute at the apex, it seems to be true that the wider the leaf the more acuminate is the apex.

Archytaea triflora Martius, Nov. Gen. Sp. 1: 117, *t.* 73. 1826. — G. Don, Gen. Syst. 1: 572. 1831. — Tulasne in Ann. Sci. Nat., Bot. III, 8: 340. 1847. — Walpers, Ann. Bot. Syst. 1: 121. 1848. — Choisy in Mém. Soc. Phys. Hist. Nat. Genève 14: 160 (Mém. Ternstr. 72). 1855. — Wawra in Martius, Fl. Bras. 12(1): 328. 1886. — Szyszlowicz in Nat. Pflanzenfam. III. 6: 181. 1893. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 151. 1925.

VENEZUELA: Amazonas, Cano Pavón, Rio San Miguel, Guainia, in open places free from inundation, alt. ca. 120 m., *L. Williams 14908* (Ch), March 26, 1942 (shrub 2.5 m. with rough bark and few branches; leaves coriaceous; flowers large, white).

Archytaea triflora Martius was the first species described in this genus and was so titled because of the three-flowered inflorescence. This species appears, from the few known records, to be confined to the Amazonas region of Brazil and Venezuela.

The single specimen examined and cited above was collected in Venezuela. Unfortunately, an accurate description cannot be drawn from the specimen, since mature flowers and fruit are not represented. However, excellent descriptions have been recorded by both Martius and Wawra, obviously from much better material. Martius describes the leaves of *A. triflora* as "obovato-lanceolata . . . tres circiter pollices longa, duodecim ad octodecim lineas lata." Translated into the metric system that would read 7–8 cm. long and up to ca. 4 cm. wide, and so the illustration of Martius depicts it. In the Williams specimen the leaves are definitely oblanceolate, the largest leaves measuring 10 cm. long, 2 cm. wide.

This species is closely allied to *A. multiflora*, but can be separated from it by the three-flowered inflorescence and the smaller glandless bracts. These characters may not appear sufficient for retaining the two species as separate entities. However, in case of the combination of the two species, *A. triflora*, being the genotype, would have priority, and I am unwilling at present to combine the two under this name or to reduce *A. multiflora* to varietal status.

Archytaea multiflora is the more vigorous of the two and enjoys a wider distribution, inhabiting the sandstone mountains of Roraima, Duida, and Ptari-tepuí. On the other hand, *A. triflora* seems to have been recorded only from the lower altitudes along the upper Amazonas region.

Realizing the close relationship of the two species, I prefer to wait until more ample and better material of *A. triflora* becomes available before making a decision involving the union of the two entities.

PLOIARIUM

Ploiarium Korthals, Verh. Nat. Gesch. Bot., ed. Temminck 135. 1840. — Walpers, Repert. 1: 376. 1842. — Schnitzlein, Iconogr. 3: *t.* 25, *fig.* 26. 1852. — Turczaninow in Bull. Soc. Nat. Moscou 31: 246. 1858. — Miquel, Fl. Ind. Bat. 1(2): 491. 1859; Fl. Ind. Bat. Suppl. 1: 483. 1862. — Hallier in Beih. Bot. Centralbl. 34(2): 34. 1916. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 151. 1925.

Archytaea Auctores quoad orbem vetustiore. Choisy in Mém. Soc. Phys. Hist. Nat. Genève 14: 160 (Mém. Ternstr. 72). 1855. — Bentham & Hooker f., Gen. Pl. 1: 188. 1862. — Scheffer in Tijdschr. Nederl. Ind. 32: 406. 1871. — Baillon, Hist. Pl. 4: 259. 1873. — Thistleton-Dyer in Hooker, Fl. Brit. India 1: 294. 1874. — Pierre, Fl. For. Cochinch. 2: *t.* 129. 1888. — Boerlage, Fl. Nederl. Indie 1: 98. 1890. — King in Jour. As. Soc. Bengal 59(2): 206 (Mat. Fl. Malay. Penins. 146). 1890. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 181. 1893. — Beccari, Nelle For. Borneo 569. 1902. — Pitard in Lecomte, Fl. Gén. Indo-Chine 1: 331, *fig.* 31. 1910. — Merrill in Jour. Straits Br. Roy. As. Soc., Spec. No. 389. 1921. — Ridley, Fl. Malay. Penins. 1: 208. 1922. — Lemée, Dict. Pl. Phan. 1: 363. 1929. — Non Martius, 1826.

Flowers hermaphroditic, solitary, axillary. Sepals 5, glabrous, imbricate, deciduous, unequal, the outer two concave, thick, the inner three larger becoming increasingly membranaceous and petaloid. Petals 5, free, deciduous, glabrous. Glands 5, alternating with petals. Stamens numerous, deciduous; filaments pentadelphous closely joined at lower end, free and thread-like above; anthers two-celled, versatile, opening thru longitudinal slits. Ovary glabrous, oblong-ovoid, 5-loculate, the locules multi-ovulate, sulcate; styles 5 free to the base, persistent with truncate or punctate stigmata. Capsule subligneous, oblong-ovoid, alternate, dehiscing septically, the margin thin, the columnella persistent. Seeds ∞ , linear, imbricate.

Evergreen trees or shrubs. Leaves alternate, coriaceous, congested at or alternating close to the apex of the branchlets. Flowers axillary, solitary; peduncles ancipitous, increasing in diameter toward the apex.

TYPE SPECIES: *Ploiarium alternifolium* (Vahl) Melchior (*Hypericum alternifolium* Vahl).

KEY TO THE SPECIES

- A. Flowers long-pedunculate; bracts disposed along the peduncle, distant from the calyx.
 - B. Stamens and petals long and of equal length (ca. 25 mm.); bracts up to 18 mm. long, 8–9 mm. wide, opposite and at middle of the peduncle.....1. *P. alternifolium*.
 - BB. Stamens (ca. 12 mm. long) shorter than the petals (15–20 mm. long); bracts 5–10 mm. long, 3–4 mm. wide, 3–5 mm. below the calyx.....2. *P. pulcherrimum*.
- AA. Flowers sessile; bracts appressed to the calyx.....3. *P. sessile*.

1. *Ploiarium alternifolium* (Vahl) Melchior in Nat. Pflanzenfam. ed. 2, 21: 151. 1925.

Hypericum alternifolium Vahl, Symb. Bot. 2: 85, t. 42. 1791. — DeCandolle, Prodr. 1: 545. 1824. — Wallich, Cat. no. 4806. 1832.

Ploiarium elegans Korthals, Verh. Nat. Gesch. Bot., ed. Temminck 135, t. 25. 1840. — Walpers, Repert. 1: 376. 1842. — Schnitzlein, Iconogr. 3: t. 215, fig. 26. 1852. — Miquel, Fl. Ind. Bat. 1(2): 491. 1859; Fl. Ind. Bat. Suppl. 1: 483. 1862.

Archytaea VahlII Choisy in Mém. Soc. Phys. Hist. Nat. Genève 14: 161 (Mém. Ternstr. 73). 1855. — Thistleton-Dyer in Hooker f., Fl. Brit. Ind. 1: 294. 1874. — Pierre, Fl. For. Cochinch. 2: t. 129. 1888. — King in Jour. As. Soc. Bengal 59(2): 206 (Mat. Fl. Malay. Penins. 146). 1890. — Pitard in Lecomte, Fl. Gén. Indo-Chine 1: 331, fig. 31. 1910. — Ridley, Fl. Malay. Penins. 1: 208. 1922.

Archytaea alternifolia (Vahl) Szyszylowicz in Nat. Pflanzenfam. III. 6: 181. 1893. — Hochreutiner in Bull. New York Bot. Gard. 6: 274. 1910. — Merrill in Jour. Str. Br. Roy. As. Soc., Spec. No. 389. 1921.

? *Ploiarium* sp., Turczaninow in Bull. Soc. Nat. Moscou 31: 246. 1858.

Small tree (or shrub) up to 5 m. high, glabrous throughout. Branchlets terete, gray (when very young, red), roughened with leaf-scars (ca. 3 mm. diam.) of varied proximation. Leaves coriaceous, usually congested at the ends of the branchlets, alternate, oblong-obovate or obovate, (5–)7–9(–15) cm. long, 1–2.5(–4) cm. wide, acute at the apex, truncate or nearly so at the narrowed base, the margin subrevolute, red, entire along the lower half, serrulate at the apical end, the midrib prominent, wider at the base, tapering toward the apex, red, the veins 8–10 pairs, at first running parallel to and as part of the midrib, then branching off, anastomosing near the margin and extending upward in the form of sub-marginal veins, the petiole merely the end of the costa, abruptly thickened at the point of attachment to the stem. Flowers solitary, axillary; peduncle 2–5 cm. long, compressed, often ancipitous, subterete near the apex, red, bibracteate; bracts usually 2 (very rarely 3, 4, or 5), opposite, 3–5 mm. below the calyx, unequal, variable in size and shape, oblong-ovate, oblong-deltoid, obovate or lanceolate, usually 5–10 mm. long, 3–4 mm. wide, entire near the base, lightly glandular-denticulate at the apex;

sepals 5, imbricate, subrotund to broadly ovate, unequal, the outer two thick, smaller, more rotund, 5-7 mm. long, about as wide, with only a very fine membranaceous margin, the inner three increasing in size, becoming petaloid, the innermost occasionally nearly membranaceous; petals 5, unguiculate, obovate, 15-20 mm. long, 7-12 mm. wide, tapering abruptly at the middle into an extended narrowed base, pink, white, to white with pink or purple margins; stamens numerous, the filaments pentadelphous, ca. 12 mm. long, joined in phalanges for ca. 5 mm. long, free above, the anthers minute, subglobose, less than 0.5 mm. across; glands 5, alternating with phalanges of stamens, pointed, ca. 1 mm. long; ovary oblong-ovoid, 10-12 mm. long, 5-sulcate, 5-loculate, the locules multiovulate, the styles 5, free, subterete, 5-7 mm. long, the stigmas truncate. Capsule oblong-ovoid, attenuate, up to 2 cm. long and 1 cm. diam. near the base, the seeds numerous.

DISTRIBUTION: Common throughout the Malay Peninsula; also in Indonesia, British North Borneo, and Sarawak and Indo-China.

INDO-CHINA: Cambodia, prov. Srê-imbél, near Po-long, *E. Poilane* 15314 (A), May 14, 1928.

MALAY PENINSULA: Johore, Pontian, Pengkalan Raja, at low altitudes, *Ngadiman* (Singapore Field no. 36662) (A), June 29, 1939 (tree 90 ft. high in peat forest).—Singapore, *Capt. Wilkes U. S. South Pacific Explor. Exped. s. n.* (G), 1838-1842.—Singapore, Botanic Garden, *C. S. Sargent s. n.* (A) in 1903.—Malacca, *M. Harvey s. n.* (A).—Precise records lacking, *A. C. Maingay* 193 (G) and *W. Griffith* 754 (G).

SUMATRA: Subdiv. Laboehan Batoe: District Kota Pinang, Langga Pajoeng on the Soengai Kanan, *Rahmat Si Toroës* 3301 (A), March 1933.—District Kota Pinang, Goenoeng Si Papan in Concess. Kaloebi, *Rahmat Si Toroës* 3771 (A), April 1933.—District Kota Pinang, Saboengan on the Soengai Kanan, *Rahmat Si Toroës* 3805 (A), April 1933.—District Bila, Hitean Haloban, south of Concess. Rantau Parapat B, *Rahmat Si Toroës* 4309 (A), May 1933.

RIOUW & LINGGA: precise locality lacking, near sea level, *Neth. Ind. For. Serv. bb.* 17166 (A), Nov. 13, 1932.

SARAWAK: Mount Matang, forest, alt. 800 ft., *J. & M. S. Clemens* 20972 (A), 1929 (tree 15 ft.; flowers white with a purple margin).—Precise locality lacking, *Native Collector* 469 (A), 868 (A), 1073 (A), 1364 (A).

BRITISH NORTH BORNEO: Sandakan and vicinity, *M. Ramos* 1313 (A, G), Sept.-Dec. 1920.—Sandakan, *Panching* 828 (A), July 1928 (tree 6 ft.; flowers white).—Jesselton, *M. S. Clemens* 9562 (A), Oct. 1915.—Marintaman, swampy forest, *Malegrito* (B. N. B. For. Dept.) 2522 (A), June 12, 1932 (shrub 6 ft. high, 1 inch diam.; flowers pale pink to whitish; fruit red; good for timber).—Membakut, on plain, *Tandom* (B. N. B. For. Dept.) 3320 (A), April 21, 1933 (shrub 10 ft. high, 2 inches diam.; flowers yellow).—Precise locality lacking, *D. D. Wood* 1898 (A), and *J. Agama* 997 (A).

BORNEO: Westerafd., Mempawah, Peladis, Andjoengan, alt. ca. 10 m., *Neth. Ind. For. Serv. bb.* 23951 (A), 23952 (A), Feb. 17, 1938.—Precise locality lacking, *J. E. Teysmann* 25 (G).

This species grows generally along the seashore or in open country at low altitudes, usually in damp spots. Occasionally it is found at somewhat higher altitudes. Ridley refers to it as growing at 3000 ft. altitude on Mt. Ophir and terms this plant of higher altitudes a "dwarf mountain form." The timber, according to Ridley, is red and is considered good for building purposes, although small. Frequent references by various collectors to its worth in building have been recorded.

One specimen collected by *Ngadiman* (Singapore Field no. 36662) in the peat forests of Jahore records the height of the tree as 90 feet. In view of the fact that all other specimens record the species as a small tree or shrub, I wrote to Mr. M. R. Henderson, the Acting Director of the Singapore Botanic Gardens, for verification of this measurement, suggesting that there might have been an error on the part of the collector. Mr. Henderson assured me that the measurement was probably correct and referred to Mr. E. J. H. Corner's book, "Wayside Trees of Malaya," in which the author describes this species as growing up to forty feet and notes that on swampy peaty soil (the same as cited in Singapore Field no. 36662) old trees may be found with massive stilted trunks reaching nearly one hundred feet high. These examples, according to Henderson, were observed personally by Corner and so may be taken to be accurate. Thus there is surprising variation in the size of the species, depending probably upon the locality.

On the Malay Peninsula, according to Ridley, this species is known in the vernacular as: *Poko Riang Riang* (Cicada tree), and *Kuat Kuat*. On Sumatra, according to *Rahmat Si Toroes*, it is known as *Galoegar Padang* and *Galoegar Poja*, and in British North Borneo, especially around Brunei, it is called *Sahuma* and *Sumah*. Pitard records the vernacular names *Chung nôm* and *Dam top* for Indo-China.

There is little variation in the leaf other than size. Some of the older leaves, found occasionally at the point of branching, are large enough (15×4 cm.) to compare favorably with those found normally in *P. pulcherrimum* (Becc.) Melch.

The bracts, generally two in number, are found about 5 mm. below the calyx, opposite in arrangement. In *Agama* 997 collected in British North Borneo, variation from this number can be found. Here there are instances of both two and four bracts, with the latter more frequent. When four bracts are present, they are arranged in two opposite pairs at the same height on the peduncle, appearing verticillate. They are unequal, however, with one pair larger than the other. In *Rahmat Si Toroes* 3805 from Sumatra, the number of bracts varies from two to three or five. When only the normal two are present, they are opposite in arrangement. When there are three, they may appear either verticillate or two opposite with one above. In the case of five bracts, the arrangement along the peduncle is similar to that of the leaves. In no instance are they verticillate. Oddly enough, on this specimen no flowers were found with four bracts.

In this species the leaf-scars are very conspicuous and quite large, measuring about three mm. in diameter. The interval between the leaf-

scars varies, of course, with the rapidity of growth. On some of the older branches the scars are so close together that a very rugose appearance results. On younger branchlets the interval may be as high as three or even five centimeters. In the latter case the branchlet appears comparatively smooth. Both these conditions may appear on single specimens, depending on the size of the specimen. Since the younger flowering growth is usually collected, the specimens with the more extended intervals are more frequent.

2. *Ploiarium pulcherrimum* (Beccari) Melchior in Nat. Pflanzenfam. ed. 2, 21: 151. 1925.

Archytaea pucherrima Beccari, Nelle For. Borneo 569. 1902, *nom. nud.* — Merrill in Jour. Straits Br. Roy. As. Soc., Spec. No. 389, 1921.

Small tree up to 4 m. high, glabrous throughout. Branches terete, gray or grayish brown with reddish leaf-scars (ca. 3 mm. diam.) at very close intervals. Leaves coriaceous, alternate, oblong-obovate, acute at the apex, truncate or nearly so at the sessile base, up to 14 cm. long, 3.5 cm. wide, the margin subrevolute, red, serrulate at the apical end, entire along the lower half, the midrib prominent, wider at the base, tapering toward the apex, red, the veins 8–10 pairs, at first running parallel to and as part of the midrib, then branching off, anastomosing near the margin and extending upward, forming submarginal veins. Flowers solitary, axillary; peduncle 3–3.5 cm. long, somewhat compressed, red, swelling in diameter to a midpoint articulation of the two opposite bracteoles, then thickening again toward the calyx; bracteoles 2, opposite, near middle of the peduncle (ca. 12 mm. below the calyx), ovate, subequal, 14–18 mm. long, 8–9 mm. wide, slightly oblique at the base (hardly cordate), glandular-denticulate at the apex; sepals 5, imbricate, unequal, the outer two thick, obovate to subrotund 11–12 mm. long, 8–12 mm. wide, the margin only lightly membranaceous, the inner three appearing petaloid, wider than long, with an increasing tendency toward membranaceous margins to nearly membranaceous, ca. 9 mm. long, 14–15 mm. wide; petals 5, unguiculate, obovate, 25–27 mm. long, 13–15 mm. wide, red; stamens numerous, the filaments pentadelphous, ca. 25 mm. long, joined in phalanges for as much as 15 mm., free above, the anthers minute, subglobose, less than 0.5 mm. diam.; glands 5, long-deltoid, ca. 3 mm. long, 1.7 mm. wide at base; ovary ovoid, ca. 10 mm. long, 5-sulcate, 5-loculate, the locules multiovulate, the styles 5, free, subterete, ca. 12 mm. long, the stigmas truncate. Capsule not seen.

DISTRIBUTION: Sarawak and Sumatra.

SARAWAK: vicinity of Kuching (Kutien), *O. Beccari* 319 (TYPE, Firenze; fragment, A), August 1865. — Vicinity of Kuching, *G. D. Haviland & C. Hose* 975 (G), Oct. 31, 1894 (tree with very hard wood, used for pepper-posts). — Mt. Stupong, old jungle, alt. 600 ft., *Native Collector* 5121 (A), July 1, 1928 (small tree 16 ft. with red flowers).

SUMATRA: Bila, vicinity of Rantau Parapat, *Rahmat Si Toroes* 2165 (A), March-May 1932.

Listed by Beccari as a *nomen nudum* under *Archytaea pulcherrima*, this species was later transferred to the present genus by Melchior with a brief description in the key. Melchior separated this species from *P. alternifolia* on the wider bracteoles, somewhat heart-shaped, and the larger flowers. The bracteoles can hardly be termed heart-shaped. They are oblique but only slightly so at the most. The larger flowers offer several characters which distinguish the species. The petals and stamens are of equal length in *P. pulcherrima* and considerably larger than in *P. alternifolia*, measuring about 25 mm. In the latter species the petals are considerably longer (up to 20 mm.) than the stamens (12 mm.). In the present species the filaments are joined for 15 mm., a distance greater than the entire length of those in *P. alternifolium*, where they are joined for only 5 mm.

The bracts in *P. pulcherrimum* are considerably larger than those of *P. alternifolium* and are placed on the peduncle midway between the branchlet and the calyx. In *P. alternifolium* the number of bracts varies from two to five, and when two (opposite), are located only 3–5 mm. below the calyx. Only four specimens were available for the study of this species. More material may show, however, that two bracts is not a constant character in this species.

The leaves are truly concentrated at the apex of the branchlet, and the branchlets are thicker with the leaf-scars in very close succession on the present species. In *P. alternifolium* there are numerous variations in these points.

This species should have and may have as wide distribution as *P. alternifolium*, although from our specimens it is known to occur only as far north as Sarawak. The Sumatran specimen, *Rahmat Si Toroës 2165* cited here, is only in bud, but the size of the bracts and their position on the peduncle, along with the size of the bud, leaves little doubt that it belongs here, although no dissections were made.

In Sarawak this species is known as *Somak* and *S'Mak o Somà* (Beccari), *Saumur* and *Tbar* (Haviland & Hose), while in Sumatra it is known as *Mombang* (Rahmat Si Toroës).

3. *Ploiarium sessile* (Scheffer) Hallier in Beih. Bot. Centralbl. 34(2): 34. 1916. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 151. 1925.

Archytaea sessilis Scheffer in Tijdschr. Nederl. Ind. 32: 406. 1871. — Boerlage, Fl. Nederl. Indie 1: 98. 1890.

A portion of the original description of Scheffer's species, *Archytaea sessilis*, is quoted below. Since no specimen of this species was available for the present study, a detailed description by the present author is not possible. In order to bring together the descriptions of all the species in one place, I am including this description here.

"Folia dense congesta, alterna, oblongo-obovata; flores axillares, sessiles; bracteae calyci adpressae; stamina petalis fere aequilonga.

"In ins. Gèbèh, ins. *Halmahairae* vicina, in littoribus, detexit Teysmann.

"Glabra; ramuli validi, rugulosi; folia versus ramorum apicem valde

conferta, alterna, basi subcordata, oblongo-obovata, obtusa, marginibus revoluta, prope basin integerrima, apicem versus glandulose obsolete serrata, coriacea, $3\frac{1}{2}$ - $4\frac{1}{2}$ poll. longa, $1-1\frac{1}{2}$ lata. Bractae rotundatae. Sepala 5 subaequalia rotundata, bracteis duplo longiora. Petala sepalis duplo longiora, obovata, apice rotundata, subcoriacea, $1\frac{1}{4}$ poll. longa. Stamina numerosa, 5-adelpha, antheris versatilibus. Ovarium, stylus et fructus ut in *A. eleganti* Choisy (*Ploiarium* Korth., Verh. Nat. Gesch., Bot., p. 135; tab. 25). Semina nec ovula vidi.—Nostra species differt a *Korthalsiana* foliorum forma, floribus sessilibus, bracteis calyci adpressis, flore majore, staminibus petalis fere aequilongis."

The characteristics mentioned in the above description which show distinction from either *P. alternifolium* or *P. pulcherrimum* are as follows:

1. *Leaves obtuse at apex.* In both *P. alternifolium* and *P. pulcherrimum* the leaves are acute even though obovate.

2. *Flowers sessile with bracts appressed to the calyx.* Since both *P. alternifolium* and *P. pulcherrimum* are known to have peduncles varying in length up to 5 cm., this character of sessile flowers alone sets the species off as distinct.

3. *Sepals twice as long as the bracts.* In this instance the relationship is with *P. alternifolium*; although no measurements are given, it is obvious that the bracts do not measure more than 3-5 mm. in length.

4. *Stamens and petals of equal length.* The length of the petals is given as one and a quarter inches or about 28 mm. This character agrees well, both in length and relationship, with the petals and stamens found in *P. pulcherrimum*.

The specimen cited by Scheffer in his description of *Archytea sessilis* was collected on the shores of the island of Gebe (Gèbèh), which the author records as near the island of Halmahera. Detailed maps of Indonesia show that Gebe lies on the equator at approximately 129.5° longitude just east of the south-central extension of Halmahera. Its long narrow shape appears to be an interrupted projection of Halmahera, and as such it probably once formed the northern coast of the Halmahera Sea.

This position is east of the Wallace Line and close to or perhaps east of the Weber Line, depending upon one's point of view. Following the line of demarkation proposed by either of these workers, one would expect the association of this species to be more closely allied with the Australasian than with the Malaysian flora. Lam (in Ann. Jard. Bot. Buitenzorg 37: 33-48. 1927) offers the broader view of a gradual transitions from the Australian to the Malayan flora, using members of the family Sapotaceae to illustrate his thesis. I prefer to follow his lead, since, as far as I know, no mention has ever been made of this genus in any flora other than the Malaysian. However, in the sessile flowers this species is very distinct from any specimen of the genus found in the Malaysian flora west of the Wallace and Weber boundaries.

THE GENUS FREYCINETIA IN FIJI

LILY M. PERRY

THIS BRIEF STUDY is the outcome of a request by Dr. A. C. Smith to name the Pandanaceae of his 1947 Fijian collection. The family is small in Fiji. In the most recent enumeration (Univ. California Publ. Bot. 12: 325-335, pls. 37-44. 1930) Professor Ugolino Martelli briefly reviewed the work already done and listed the species previously known. Of these, five belong to *Freycinetia* and three to *Pandanus*. Professor Martelli then proceeded to define three new species of *Freycinetia* and elaborated the descriptions of three earlier ones. In *Pandanus* he recorded two new species and two new varieties and redefined *P. Joskei* Balf. Since then two species have been added to *Freycinetia*.

The collection at hand consists of fourteen numbers. Only one, A. C. Smith 4917, belongs to the genus *Pandanus*. It is undoubtedly *P. vitiensis* Mart., a species described as having an unbranched trunk. This character apparently has some tendency to vary, as the label of the above-mentioned specimen (plant 4-10 m. high, the trunk straight, slender, 15-20 cm. diam., unbranched nearly to summit and then with a few spreading branches) indicates a slight branching near the apex of the trunk.

On looking over the material of *Freycinetia* it seemed to me it would be most helpful if I could borrow for comparison, from the University of California, some of the specimens named by Professor Martelli. I am deeply indebted to Dr. Herbert Mason, Director of the Herbarium, for this loan. With it and the collections of the Gray Herbarium and the Arnold Arboretum, I have drawn up a tentative key to the species. Some species are still poorly represented, and further material is necessary to establish their tenableness or the lack of it. A few collections have only the shorter leaves (in most cases the bracts have fallen) immediately below the spadices, and no indication of the variation in the length of the leaves is given by the collector. I have been unable to find characters to distinguish *F. Gillespiei* Mart. from *F. Storckii* Seem.; however, I have seen only a photograph of the type, a couple of detached leaves, and a few detached immature berries.

KEY TO THE SPECIES

Syncarps fairly long (3-7.5 cm.).

Syncarps narrowly cylindric (4-6 cm. long, 1-1.2 cm. diam.); leaves narrowed and plicate above the base appearing as if petiolate.....*F. caudata*.

Syncarps thicker in proportion to the length (3-7.5 cm. long \times 2-4.5 cm. diam., in *F. Pritchardii* 2-3.5 \times 1-2 cm.); leaves not plicate for any distance above the base.

Leaves 30–60 cm. long.

Peduncles smooth; berries obclavate or oblong, truncate at apex.....*F. Milnei*.

Peduncles \pm scabrid; berries angled and subconic toward the flat apex.

Syncarps rather thick (4–7.5 cm. long, 2.5–4.5 cm. diam.); that portion of the berry above the ovary forming an elongate (3–4 mm.) free apex; leaves 3–4 cm. broad....

.....*F. Parksii*.

Syncarps not so thick (3–6 cm. long, 2–3 cm. diam.); that portion of the berry above the ovary forming a shorter (1.5–2.5 mm.) free apex; leaves 1.5–3 cm. broad.....

.....*F. Storckii*.

Leaves 25–30 cm. long, 1–1.5 cm. broad; peduncles smooth.....

.....*F. Pritchardii*.

Syncarps shorter (1–2.5 cm., in *F. Pritchardii* to 3.5 cm., long).

Leaves short in proportion to the width (7–11.5 cm. long, 1–1.9 cm. wide).....*F. Grayana*.

Leaves longer in proportion to the width (20–45 cm. long, 0.3–2 cm. wide).

Peduncles smooth.

Leaves 30–45 cm. long, 1.7–2 cm. wide, caudate, the cauda 1.5–3 cm. long.....*F. intermedia*.

Leaves 25–30 cm. long, 1–1.5 cm. wide, attenuate-acute.....

.....*F. Pritchardii*.

Peduncles \pm scabrous.

Peduncles sparsely setose-scabrid on the angles, otherwise smooth.....*F. Degeneri*.

Peduncles, at least in the upper half, closely setose-scabrous.

Syncarps small, \pm subglobose (1–1.5 cm \times 0.7–1.5 cm.), with relatively few berries.....*F. vitiensis*.

Syncarps larger, broadly oblong (1.7–2.5 cm. \times 1.3–2 cm.), with numerous berries.....*F. Graeffei*.

Freycinetia caudata Hemsley in Kew Bull. 1896: 167. 1896. — Warburg in Pflanzenz. 3(IV. 9): 38. 1900. — Martelli, Webbia 3: 310. 1910; in Univ. California Publ. Bot. 12: 327. 1930.

VITI LEVU: Tholo North: Nandarivatu, *O. Degener & E. Ordonez* 13679. Mba: western slopes of Mt. Nanggaranambuluta [Lomalangi], east of Nandarivatu, *A. C. Smith* 4775, alt. 850–1000 m.; western and southern slopes of Mt. Tomanivi [Mt. Victoria], *A. C. Smith* 5254, alt. 850–1150 m. Nandronga and Navosa: northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, *A. C. Smith* 5601, alt. 725–825 m. Naitasiri: northern portion of Rairaimatuku, between Mt. Tomanivi [Mt. Victoria] and Nasonggo, *A. C. Smith* 5778, alt. 870–970 m.; on the Tamavua-Sawani road, *W. A. Setchell & H. E. Parks* 15154 (Univ. California).

VANUA LEVU: Mbua: southern slope of Mt. Seatura, *A. C. Smith* 1615, alt. 400 m. Thakaundrove: Mt. Ndikeya, *A. C. Smith* 1910, alt. 500 m. Thakaundrove-Mathuata Boundary: crest of Korotini Range, between Navitho Pass and Mt. Ndelaikoro, *A. C. Smith* 559,

alt. 650–900 m. All collections from dense forest. Fiji, without further locality, *J. Horne* 592 (Gray); *U. S. Expl. Exped. 1838–1842* (Gray).

Although there is a great deal of variation in the size of the leaves (21–31 cm. long, 1.8–3.5 cm. wide), these specimens without doubt belong to *F. caudata* Hemsl. The species is very easily recognized by a combination of the following characters: the narrow cylindric syncarps, the elongate plicate fold at the base of the leaves, and the abruptly caudate-acuminate apex.

Freycinetia Milnei Seemann Fl. Vit. 283, *pl.* 86. 1868. — Solms-Laubach in *Linnaea* 42: 102. 1878. — Warburg in *Pflanzenr.* 3(IV. 9): 41. 1900. — Gibbs in *Jour. Linn. Soc. Bot.* 39: 179. 1909. — Martelli, *Webbia* 3: 313. 1910; in *Univ. California Publ. Bot.* 12: 330. 1930.

VITI LEVU: Tholo West: Mbuyombuyo, near Namboutini, *O. Degener (A. Tabualewa)* 15585. Mba: summit of Mt. Tomanivi [Mt. Victoria], *A. C. Smith* 5155, alt. 1290–1323 m., dense mossy forest.

VANUA LEVU: Thakaundrove: Savu Savu Bay region, *O. Degener & E. Ordóñez* 13819A, alt. sea level to 150 m., in dense forest. Mbua: southern portion of Seatovo Range, *A. C. Smith* 1710 (Gray), alt. 100–350 m.

TAVEUNI: western slope, between Somosomo and Wairiki, *A. C. Smith* 716, alt. 300 m., edge of forest; summit of Uluingalau, *A. C. Smith* 895, alt. 1100–1120 m., liana forming dense thickets. Fiji, without further locality, *Seemann* 648 (ISOTYPE, Gray).

The species is distinguished by the long leaves, the fairly slender syncarps with blunt almost imperceptibly tapered berries, and the smooth peduncles. These characters are constant in the first four specimens cited and in the isotype. The other two collections have slightly more tapering berries and the syncarps are about 1 cm. shorter than in the others.

Freycinetia Parksii Martelli in *Univ. California Publ. Bot.* 12: 330, *pl.* 39. 1930.

VITI LEVU: head of Suva Harbor, *H. E. Parks* 20045 (ISOTYPE, Univ. California); woods near Tamavua, *Gillespie* 2469 (Univ. California); Mba: eastern slopes of Mt. Koroyanitu, Mt. Evans Range, *A. C. Smith* 4246, alt. 950–1050 m., dense low forest; summit of Mt. Nanggaranambuluta [Lomalangi], east of Nandarivatu, *A. C. Smith* 4876, alt. 1100–1120 m., dense forest.

KANDAVU: hills above Namalata and Ngaloa Bays, *A. C. Smith* 77 (Gray, Univ. California), alt. 200–400 m., high-climbing liana in forest; Mt. Mbuke Levu, *A. C. Smith* 244 (Gray, Univ. California), alt. 200–500 m.

VANUA LEVU: Mbua: "Sandalwood Bay," i.e., Mbua Bay, *U. S. Expl. Exped. 1838–1842* (Gray).

I have also examined the following specimens from the University of California: *H. E. Parks* 20108, 20385, *J. W. Gillespie* 2798 and two unnumbered specimens. The specimen *A. C. Smith* 77 is apparently from young growth, as the leaves are narrower and thinner than those of most specimens. The peduncles in the Univ. California specimen are almost smooth, but in that of the Gray Herbarium they are scabrous just below

the syncarps. For the most part the character of smooth or scabrous peduncles seems to be fairly constant. In this species the mature berries are long and slender with a tapering and fairly long apex above the ripened ovary. The berries are very numerous and the syncarp is thicker than in the other species.

Freycinetia Storckii Seemann Fl. Vit. 283, *pl.* 85. 1868. — Solms-Laubach in *Linnaea* 42: 104. 1878. — Warburg in *Pflanzenr.* 3(IV. 9): 38. 1900. — Gibbs in *Jour. Linn. Soc. Bot.* 39: 179. 1909. — Martelli, *Webbia* 3: 315. 1910; in *Univ. California Publ. Bot.* 12: 331. 1930.

VITI LEVU: Naitasiri: Suva Pumping Station, *O. Degener & E. Ordonez* 13765, alt. 30–80 m.; 9 miles from Suva, *J. W. Gillespie* 3497, 3498 (Univ. California). Tholo North: vicinity of Nandarivatu, *O. Degener* 14821A, alt. 750–900 m. Serua: vicinity of Ngaloa, *O. Degener* 15129, alt. sea level to 150 m.

VANUA LEVU: Mathuata: southern slopes of Mt. Numbuiloa, east of Lambasa, *A. C. Smith* 6384, alt. 100–350 m., open forest. Thakaundrove: Mt. Mbatini, *A. C. Smith* 689 (Gray, Univ. California), alt. 700–1030 m.

TAVEUNI: summit ridge trail from Soma-Soma, *J. W. Gillespie* 4819 (Univ. California).

I have seen no authentic material of this species, and perhaps for this reason its limits are rather difficult to determine. This also explains why I have not listed *F. Gillespiei* Mart. as a synonym, although I could find no characters to separate the two. *Freycinetia Storckii* Seem. seems to be most nearly related to *F. Parksii* Mart. The leaves are shorter and narrower than in the latter species; the syncarps are not so thick; the berries are not so crowded, and their heads are a little shorter and mostly not so slender.

Freycinetia intermedia Merrill & Perry in *Sargentia* 1: 4. 1942.

In the material at hand I have found no specimen which appears to be transitional between the type-collection of this species (*O. Degener* 15054) and the others known from Fiji.

Freycinetia Pritchardii Seemann, Fl. Vit. 283, *pl.* 84. 1868. — Solms-Laubach in *Linnaea* 42: 104. 1878. — Warburg in *Pflanzenr.* 3(IV. 9): 37. 1900. — Gibbs in *Jour. Linn. Soc. Bot.* 39: 179. 1909. — Martelli, *Webbia* 3: 314. 1910; in *Univ. California Publ. Bot.* 12: 328. 1930.

VITI LEVU: Mba: hills between Nggaliwana and Nandala Creeks, south of Nauwanga, *A. C. Smith* 5667, alt. 725–850 m., dense forest; Nandarivatu, *O. Degener & E. Ordonez* 13680, *J. W. Gillespie* 3747 (Univ. California); Suva, *H. E. Parks* 20944 (Univ. California).

OVALAU: *U. S. Expl. Exped.* 1838–1842 (Gray).

The first cited specimen is from a staminate plant with a terminal 6-bracted inflorescence. The outer bracts are lanceolate, 7–11 cm. long, \pm 2 cm. wide near the base, long-acuminate, the margin and the midrib denticulate at the apex only. The inner bracts are 5–7 cm. long, and

acute or short-acuminate. The spadices are about 2.5 cm. long, 0.5 cm. diameter, on smooth peduncles about 2 cm. long. The stamens are in small clusters arising from the base of folds spirally arranged in the fleshy column.

This is a very well marked species with acuminate but not caudate leaves, smooth peduncles, and obovoid berries with a broad flat head and pyramidal sides.

***Freycinetia Grayana* sp. nov.**

Scandens; ramulis apicem versus \pm 5 mm. crassis, internodiis \pm 1 cm. longis; foliis lanceolatis, 7–11.5 cm. longis, 1–1.9 cm. latis, apice sensim attenuato-acuminatis, margine in sicco leviter revolutis, costa apicem prope in pagina inferiore remote denticulata, auriculis fractis, deciduis; inflorescentiis terminalibus, pedunculo brevissimo (0.5 cm. longo), pedicellis 2–2.5 cm. longis, setoso-scabridis; syncarpiis late oblongis, 2–2.5 cm. longis, 1.5–1.8 cm. latis; baccis lageniformibus in sicco \pm 6 mm. longis, apice annulo cinctis; stigmatibus 3–8, plerumque 3–5; seminibus immaturis.

VANUA LEVU: "Sandalwood Bay," i.e., Mbua Bay, *U. S. Expl. Exped. 1838–1842* (TYPE, Gray; *U. S. Nat. Herb.*).

I have not seen the specimen in the *U. S. National Herbarium*, but Dr. Smith has checked it carefully and given me several measurements which, when they varied from those of our specimen, I have included in the description. He also suggested that there is some question as to the locality. The *U. S. Nat. Herb.* specimen of this expedition has two small notes as to locality, reading "Ovelou 3" (i.e., Ovalau), and "Sandalwood Bay" (i.e., Mbua Bay, Vanua Levu).

The syncarps of this species are about the size of some in specimens of *F. Graeffei* Mart., but the berries are less crowded and more like those in *F. vitiensis* Seem. At the apex is a very definite ring surrounding the stigmas and somewhat lighter in color than the rest of the berry. The obvious character of this species is foliar, the leaves relative to their length being broader than those in any other species.

***Freycinetia Degeneri* Merr. & Perry in *Sargentia* 1: 4. 1942.**

In this collection I have not found any material to match this species based on *O. Degener 15128*.

***Freycinetia Graeffei* Martelli in *Univ. California Publ. Bot.* 12: 326, *pl.* 37. 1930.**

VITI LEVU: Naitasiri: Tamavua woods, 7 miles from Suva, *J. W. Gillespie 2125*, alt. 150 m. Tholo North: Mt. Korolevulevu, *B. E. Parham 1440*; Nandarivatu, *W. Greenwood 626A*, alt. about 830 m.; vicinity of Nandarivatu, *O. Degener 14551, 14821*, alt. 750–900 m. Mba: hills east of Nandala Creek, about 3 miles south of Nandarivatu, *A. C. Smith 6238*, alt. 850–970 m., dense forest; western slopes of Mt. Nanggaranambuluta [Lomalangi], east of Nandarivatu, *A. C. Smith 4796*, alt. 1000–1100 m., dense forest. Nandronga and Navosa: northern portion of Rairai-

matuku, between Nandrau and Nanga, *A. C. Smith* 5543, alt. 725–825 m., dense forest. Namosi: hills near Navua River, *W. Greenwood* 1051, alt. 200–300 m.

VANUA LEVU: Thakaundrove: Savu Savu region, Vatunivua-monde Mt., *O. Degener & E. Ordonez* 13966, alt. sea level to 400 m.; Yanawai River Region, Mt. Kasi, *A. C. Smith* 1763, alt. 300–430 m., dense bush. Fiji, without further locality, *J. Horne* 844, 903 (Gray).

In the comments under the original description Professor Martelli indicates that the leaves of this species are much longer than those of *F. vitiensis* Seem. This is true of most of the specimens above cited. However, in the two collections *Greenwood* 626A and 1051 they are shorter (around 17 cm.) and suggest very much *F. vitiensis* Seem. The crowding of the berries in the syncarp, however, seems to indicate that they belong to *F. Graeffei* Mart. Usually the leaves are caudate, but in four specimens they are only shortly so. The best character seems to be the numerous berries in the syncarp, with heads somewhat longer than those of *F. vitiensis* Seem.

Freycinetia vitiensis Seemann, Fl. Vit. 282, pl. 83. 1868. — Solms-Laubach in Linnaea 42: 105. 1878. — Warburg in Pflanzenr. 3(IV. 9): 35. 1900. — Martelli, Webbia 3: 315. 1910; in Univ. California Publ. Bot. 12: 326. 1930.

VANUA LEVU: Thakaundrove-Mathuata Boundary: crest of Korotini Range, between Navitho Pass and Mt. Ndelaikoro, *A. C. Smith* 546, alt. 650–900 m., dense forest.

TAVEUNI: borders of lake east of Somosomo, *A. C. Smith* 922, alt. 700–900 m. Fiji, without further locality, *Seeman* 647 (ISOTYPE, Gray).

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

THE GENUS *ILEX* IN CHINA, IV

SHIU-YING HU

(Continued from page 80)

SECTION VIII. LAUROILEX, SECT. NOV.

Arbor sempervirens; ramulis glabris; foliis crasse coriaceis, integerrimis; inflorescentiis fasciculatis vel pseudo-paniculatis, compositis ex trichotomis cymosis vel umbellatis; floribus 5-7-meris; fructibus parvis, globosis, ca. 4 mm. diametro; pyrenis laevibus, 5-7, minutis, 2 mm. longis, dorso 3-striatis, esulcatis; endocarpio coriaceo.

In having entire leaves, 5-7-merous flowers and small smooth coriaceous pyrenes, this section shows a close relationship with ser. Longecaudatae. It is distinguished from the latter by its larger leaves and cymose or umbelliform rather than uniflorous individual branches in pistillate fascicles. I do not agree with Loesener, who placed *Ilex venulosa* Hook. f. in the subgenus *Byronia*, as it lacks the characters of that group. *Byronia* is essentially characterized by numerous (10-18) pyrenes, while the two species I place in the new section *Lauroilex* have but 5-8 pyrenes.

Two species occur in China. Their distribution is as shown in figure 9.

KEY TO THE SPECIES

- A. Leaves thick-coriaceous, shortly acuminate; lateral nerves 6-8 pairs, obscure; inflorescence of fasciculate umbels or umbelliform cymes in some staminate ones, the central axis scarcely developed; pyrenes 3-striate, the striae slightly impressed. (Mt. Omei in West China)84. *I. omeiensis*.
- AA. Leaves coriaceous, caudate-acuminate; lateral nerves 15-22 pairs, prominent on both surfaces; inflorescence of pseudo-paniculate compound trichotomous cymes with a central axis up to 3 cm. long, rarely fasciculate; pyrenes striate, the striae slightly elevated. (Yunnan, India)85. *I. venulosa*.
84. *Ilex omeiensis* H. H. Hu & Tang in Bull. Fan Mem. Inst. Biol. Bot. 9: 245. 1940.

Ilex omeiensis S. Y. Hu in Ic. Pl. Omei. 2: pl. 154. 1946.

An evergreen shrub or tree up to 10 m. high with glabrous branchlets, large acuminate thickly coriaceous entire oblong leaves with 6-8 pairs of lateral nerves, fasciculate umbelliform inflorescences, and 6 or 7 small smooth 3-striate pyrenes.

Branchlets subterete, the second year's growth 4-6 mm. thick, cinereous or subfuscous, more or less rugose with slightly elevated semicircular leaf-scars and persistent bracts and scars of the inflorescences, often

longitudinally rimulose, the lenticels inconspicuous; current year's growth 3-4 mm. thick, cinereous or nigrescent, slightly angular, plicate, the terminal buds subglobose, poorly developed. Leaves occurring rarely on second year's growth, 2-5 cm. apart; stipules deltoid, acute, 0.75-1.5 mm. long, persistent; petioles cylindric, 13-20 mm. long, 2-3 mm. thick, one-ninth to one-sixth as long as the lamina, sulcate above, rugose beneath; lamina thick-coriaceous, glabrous, olivaceous, shiny above, opaque beneath, broadly elliptic or oblong-elliptic, 10-20 cm. long, 4-7 cm. wide; base obtuse or rounded; apex shortly acuminate, the acumen 0.5-1 cm. long; margin entire; midrib impressed above, elevated and prominent beneath, the lateral nerves in 6-8 pairs, evident or obscure, the reticulation of the veinlets obscure or evident above. Inflorescences fasciculate, axillary, hirsute, the fascicles composed of 5-9 cymes or umbels, the bracts deltoid, acute, 2 mm. long, 1.75 mm. wide. Staminate inflorescences: individual branches of the fascicles of trichotomous cymes or umbels; peduncles 20-25 mm. long, the secondary axes 2-3 mm. long, the pedicels 6-8 mm. long, with minute basal prophylla; flowers 5- or 6-merous; calyx patelliform, 3-4 mm. in diameter, puberulous and ciliate, deeply 5- or 6-lobed, the lobes deltoid, obtuse, 1.5 mm. long, 1.25 mm. wide at the base; corolla rotate, 6 mm. across, the petals ovate-elliptic, 2.5 mm. long, 1.75 mm. wide, one-sixth connate at the base; stamens shorter than the petals, the anthers ellipsoid, 1 mm. long; rudimentary ovary subglobose, 1 mm. in diameter. Pistillate inflorescences: individual branches of the fascicles umbelliform; peduncles 7-12 mm. long, the pedicels 5-7 mm. long, with 1-2 sub-basal prophylla; flowers 6- or 7-merous; calyx 3.5 mm. across, deeply 6- or 7-lobed; corolla suberect, 4 mm. across, the petals 6 or 7, ovate, 1.5 mm. long, one-fifth connate at the base; staminodes very minute, half the length of the petals, the sterile anthers cordate; ovary ovoid, 2 mm. long, 1.5 mm. wide at the base; the stigma mammiform, rarely cristate. Fruit red, globose, 4 mm. in diameter, the stigma thick-discoid, conspicuous. Pyrenes 6 or 7, trigonous in cross-section, 2 mm. long, 1 mm. wide, 3-striate on the back, the striae slightly impressed, sometimes anastomosing, the endocarp smooth, coriaceous.

CHINA: Szechuan: Mt. Omei, *C. Y. Chiao & C. S. Fan* 419 (A); *H. C. Chow* 7551 (A), 8207 (A); *T. H. Tu* 381 (SS); *C. W. Yao* 4912 (SS); *F. T. Wang* 23230 (A).

This species is known only from Mt. Omei in western Szechuan, where it grows in mixed forests at an altitude of 1500 m. It flowers in June and by August the red fruits are mature. It is closely related to *Ilex venulosa* Hook. f. In the size and shape of its leaves and in the number, size, and striation of the pyrenes the two species resemble each other. They differ in their inflorescences and in their leaf characters. *Ilex venulosa* has pseudopaniculate compound cymes or umbels and caudate-acuminate leaves with 15-22 prominent lateral nerves on each side, while *Ilex omeiensis* has fasciculate pseudo-umbels and merely acuminate leaves with but 6-8 obscure lateral nerves.

Ilex omeiensis H. H. Hu & Tang (1940) and *Ilex omeiensis* S. Y. Hu (1946) are exact synonyms, being based on the same collections. I was unaware of the 1940 publication when I prepared my description in 1942. Since under war conditions there was no exchange of publications between occupied China and free China, I saw no copy of the Hu and Tang paper until after I reached Boston. It is of some interest to note that regarding this species, known as yet only from Mt. Omei, we independently reached the same conclusion, even selecting the same specific name for the species.

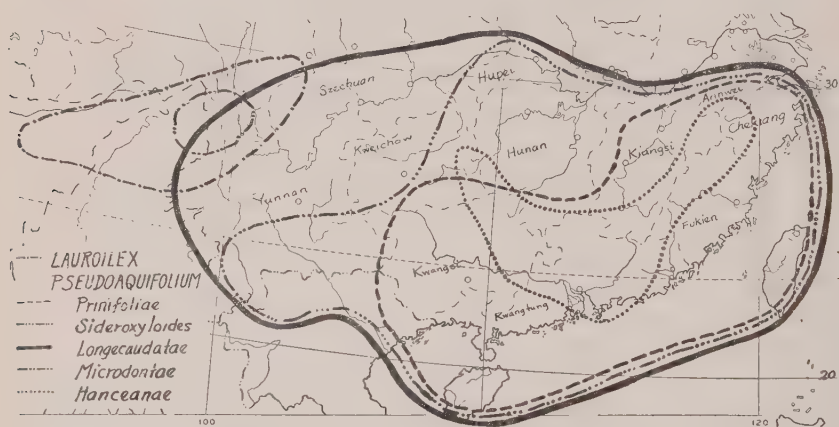


FIG. 9. Geographic distribution of the sections *Lauroilex* and *Pseudoaquifolium* including the five series of the latter section.

85. *Ilex venulosa* Hook. f., Fl. Brit. Ind. 1: 602. 1875; Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 89 (Monog. Aquif. 1: 89). 1901; Anon. in Notes Bot. Gard. Edinb. 17: 10, 155, 173. 1929-30; Comber in Notes Bot. Gard. Edinb. 18: 58. 1933.

An entirely glabrous evergreen shrub (ex Forrest) or a small tree (ex Tsai) up to 8 m. high, with entire coriaceous caudate leaves, 15-22 pairs of prominent parallel lateral nerves, pseudo-paniculate rarely fasciculate compound cymes, small fruits, and 5-7 smooth coriaceous striate pyrenes.

Branchlets subfuscous or nigrescent, minutely rimulose; second year's growth 4-5.5 mm. thick, the lenticels conspicuous, white, elliptic; current year's growth slightly angular, 3 mm. thick, plicate, shiny, nigrescent. Leaves on both first and second years' growth, 1-3 cm. apart; stipules deltoid, acute, 1 mm. long; petioles cylindric, rather robust, 1.3-2.2 cm. long, 2 mm. thick, one-seventh to one-fifth the length of the lamina, narrowly canaliculate above, plicate-rugose beneath; lamina coriaceous, olivaceous or brunneo-olivaceous, opaque on both surfaces, ovate or oblong-elliptic, 10-20 cm. long, 3-6.5 cm. wide; base rounded or obtuse; apex caudate-acuminate, the acumen very narrow, 2-3 cm. long; margin entire; midrib deeply sulcate above, strongly elevated and prominent

beneath; lateral nerves 15–22 on each side, elevated on both surfaces, the reticulations prominent on both surfaces. Inflorescences pseudo-paniculate or rarely fasciculate, axillary on second year's growth, very rarely solitary at the base of a new branch, the central axis 4–30 mm. long, 1.5–2 mm. in diameter. Staminate inflorescences: individual branches of the panicles cymose, 2–4 times trichotomous; peduncles 10–17 mm. long, subtended by a broad deltoid, warty, acute bract with 2 stipule-like appendages, the secondary axes 3–5 mm. long, the bracts deltoid, acute; pedicels 2 mm. long, with 2 basal prophylla; flowers 5- or 6-merous; calyx patelliform, 3 mm. across, the lobes ovate, deltoid, ciliate; corolla rotate, 6 mm. across, the petals oblong-ovate, 2.5 mm. long, 1.8 mm. wide, one-sixth connate at the base; stamens slightly shorter than the petals, the anthers oblong-ovoid, 1 mm. long; rudimentary ovary subglobose-ovoid, the apex obtuse. Pistillate inflorescences: individual branches of the panicles trichotomous cymose or subumbelliform; peduncles 7–12 mm. long; pedicels 2–3 mm. long; calyx 2–3 mm. across, 6–8-lobed, the lobes deltoid, ciliate; corolla suberect, 3–4 mm. across, the petals obovate, 1.5 mm. long, one-fifth connate at the base; staminodes one-third the length of the petals, the sterile anthers cordiform; ovary ovoid-globose, 1.5 mm. long, the stigma capitate, 5–7-lobed. Fruit globose, red, 3–4 mm. in diameter, the persistent calyx 3 mm. across, the stigma navel-like or thin-discoïd. Pyrenes 5–7, oblong-ovoid in outline, in cross-section trigonous, 2 mm. long, 1 mm. wide, 3-striate, the striae slightly elevated, sometimes branched, the sides smooth, the endocarp coriaceous.

CHINA: Yunnan: without precise locality, *G. Forrest* 7530 (A), 9801 (A), 13672 (A), 15725 (A), 16063 (A), 21085 (A), 26168 (NY), 26216 (A), 26218 (A, NY, US); *M. K. Li* 1133 (A); Teng-yueh, *J. F. Rock* 7972 (A); Lu-se-hsien, *T. H. Tsai* 56402 (A); Mong-ko, *H. T. Tsai* 56425 (A).

UPPER BURMA: Kachin Hills, *Shaik Mokim* in 1889 (A).

INDIA: Khasia, *Griffith* (G); *Lemann* in 1844 (G); *Oldham* 8 (A); *Schlagintweit* in 1855 (G); East Bengal, *Griffith* 2009 (G); *Hooker & Thomson* *Ilex* (8), (G); Assam, *King's Collector* (A).

This plant was first described from specimens collected in northern India. It is a shrub growing in thickets or a tree occurring in woods. Its dull yellow flowers appear in February and March.

It is allied to *Ilex omeiensis* H. H. Hu & Tang, but the latter has fasciculate umbels, acuminate but not caudate leaf-apices, and only 6–8 pairs of obscure lateral nerves.

85a. *Ilex venulosa* var. *simplicifrons*, var. nov.

A typo differt inflorescentiis magis compactis, cymis valde reductis, parvis, paucifloris; pedunculo 2 mm. longo.

CHINA: Yunnan: Teng-yueh, *G. Forrest* 9800 (A, TYPE).

INDIA: Khasia Hills, ex Herb. Forest School, Dehra Dun (A).

This variety differs from the typical *Ilex venulosa* in having more compact inflorescences with much reduced cymes, which are smaller in size

and fewer flowered than in the typical form. The peduncles are only 2 mm. long.

SECTION IX. PSEUDOAQUIFOLIUM, SECT. NOV.

Arbor vel frutex; foliis integerrimis, raro crenulato-serratis; inflorescentiis fasciculatis; floribus 6-8-meris (raro 4-meris); pyrenis 6-8, raro 4, striatis, esulcatis, raro sulcatis, endocarpio coriaceo, raro sublignescente.

Twenty-seven species in five series occur mostly in South China. The range of each series is as shown in Figure 9.

KEY TO THE SERIES

- A. Endocarp of the pyrenes sublignescent; pyrenes 3-striate and 2-sulcate, the striae clinging to the endocarp; branchlets slender, so ridged that the cross-section appears quadrangular.....Series 1. *Prinifoliae*.
- AA. Endocarp coriaceous; pyrenes smooth, or striate and esulcate, the striae easily detached from the endocarp; branchlets subterete.
 - B. Fruiting pedicels 8-20 mm. long; always longer than the diameter of the fruit; fruit in fascicles or pseudoracemes.
 - C. Fruit 5-8, rarely 4 mm. in diameter, with columnar or capitate stigma (except *Ilex kobuskiana*); the style usually evident.....Series 2. *Sideroxyloides*.
 - CC. Fruit 3-4 rarely up to 5 mm. in diameter, the style lacking, the stigma thin-discoid.
 - D. Leaves entire, the apex usually caudate; pyrenes 4, rarely 5.....Series 3. *Longecaudatae*.
 - DD. Leaves serrate, crenate or subentire; pyrenes 6 or 7....Series 4. *Microdontae*.
- BB. Fruiting pedicels 1-3 mm. long, always shorter than the diameter of the fruits; fruit usually in pairs.....Series 5. *Hanceanae*.

SERIES 1. PRINIFOLIAE, STAT. NOV.

Ilex subgen. *Euilex*, series C. *Aquifolium*, sect. 4, *Prinifoliae* Loes. in Engler & Prantl, Nat. Pflanzenfam. Nachtr. 220. 1897, et in Nov. Act. Acad. Caes. Leop.-Carl. Nat. Cur. 78: 356 (Monog. Aquif. 1: 356). 1901.

Evergreen shrubs or small trees with slender angular pubescent branchlets; leaves chartaceous or membranaceous, entire, subentire, or pauciserrate, the apex acute and the tip mucronate or cuspidate, usually pubescent; inflorescences fasciculate or pseudopaniculate; flowers 4-8-merous; stamens shorter than the petals; ovary with an evident style; fruit with 5, 6, or 7 pyrenes; pyrenes 3-striate, the endocarp thick-coriaceous or sublignescent.

A transitional group between the fasciculate and the cymose species and also between the evergreen and the deciduous species.

KEY TO THE SPECIES

- A. Individual branches of the pistillate fascicles 1-5-flowered; uniflorous pedicels 5 mm. long; peduncles of the cymes 3-7 mm. long.....86. *I. stewardii*.
- AA. Individual branches of the pistillate fascicles uniflorous, rarely 1-3-flowered; fruiting pedicels 2-3 mm. long; peduncles of the cymes 1-3 mm. long.
- B. Leaves serrate or subentire, the lamina elliptic or obovate-elliptic, hirsute; branchlets hirsute. (East and South China).....87. *I. pubescens*.
- BB. Leaves entire, the lamina broad-elliptic or obovate-oblong, glabrous; branchlets puberulous. (Hainan and southwest Kwangsi).....88. *I. hainanensis*.

86. *Ilex stewardii*, sp. nov. •

Frutex vel arbor parva; ramulis puberulentibus, foliis chartaceis vel crasse membranaceis, integerrimis, lanceolatis, oblongo-lanceolatis vel oblongo-ellipticis, 5-8.5 cm. longis, 1.4-3 cm. latis, apice acuminatis vel caudatis, acuminibus 8-15 mm. longis, costa supra impressa, nervis lateralibus 9-11 paribus, supra evidentibus, subtus prominentibus; inflorescentiis foemineis fasciculatis vel pseudopaniculatis, compositis 1-5-floribus cymis, pedunculis 3-7 mm. longis, pedicellis 3-5 mm. longis, floribus 6-vel 7-meris, calycibus eciliatis, corolla rotata, petalis 1.5-2 mm. longis; staminodiis quam petalis $\frac{1}{2}$ brevioribus, ovario ovoideo, stigmate crasse discoideo; fructibus 3 mm. diametro, stylis evidentibus; pyrenis 6, 3 mm. longis, 1 mm. latis, dorso 3-striatis, esulcatis, endocarpio coriaceo.

An evergreen shrub or small tree up to 8 m. high, with minutely puberulent branchlets, lanceolate, oblong-lanceolate, or oblong-elliptic chartaceous entire leaves with a long-acuminate or caudate apex, fasciculate or pseudopaniculate pistillate inflorescences, small ovate-subglobose fruits, and 6 or 7-longitudinally striate-esulcate coriaceous pyrenes.

Branchlets brunneous, the third year's growth 2.5-4 mm. in diameter, longitudinally plicate-rugose, minutely and unevenly rimulose, the lenticels lacking, the leaf-scars narrowly subcrescent-shaped, slightly elevated; second year's growth 2 mm. in diameter, subquadrangular, ridged, puberulous; current year's growth slender, 1-1.5 mm. in diameter, longitudinally deeply canaliculate, sparsely and distinctly puberulent, the terminal buds poorly developed, usually abortive, with loose acute and narrow scales. Leaves occurring even on the third year's growth, 7-14 mm. apart; stipules long-deltoid, callose, acute, persistent; petioles 5-8 mm. long, about one-tenth the length of the lamina, narrowly and deeply canaliculate and minutely puberulous above, glabrous and rugose beneath; lamina chartaceous or thickly membranaceous, brunneous-olivaceous, shiny above, opaque and epunctate beneath, lanceolate, lanceolate-oblong or narrowly oblong-elliptic, 5-8.5 cm. long, 1.4-3 cm. wide; base acute or acuminate, rarely obtuse; apex long-acuminate or caudate, the acumen 8-15 mm. long, the point cuspidate or mucronate; margin entire, very rarely pauciserrate near the apex; midrib narrowly and deeply impressed and minutely puberulous

above, elevated and glabrous beneath, the lateral nerves 9–11 pairs, evident above, prominent beneath, the reticulation of the secondary nerves and the veinlets conspicuous underneath. Pistillate inflorescence fasciculate or pseudopaniculate, sessile, puberulous, the central axis 3–12 mm. long, with active or abortive terminal buds; bracts broadly deltoid, acute, persistent; individual branches 1–5-flowered, when uniflorous the pedicels 5 mm. long with 2 submedian prophylla; when multiflorous cymose or subumbelliform, the peduncles 3–7 mm. long, the pedicels 3–5 mm. long, with 2 basal prophylla; flowers 6- or 7-merous; calyx patelliform, 2 mm. across, deeply lobed, the lobes ovate-deltoid, erose, eciliate, acute; corolla rotate, 4–5 mm. across, the petals oblong, 1.5–2 mm. long, one-sixth connate at the base; staminodes one-half the length of the petals, sagittate; ovary ovoid, 1.5 mm. long, 1 mm. wide; the stigma thick-discoid. Staminate flowers not seen. Fruit ovoid-subglobose, 4 mm. long, 3 mm. in diameter, when dry castaneous or nigrescent, the persistent calyx sub-explanate, 2.5–3 mm. across, the stigma thick-discoid, the style sometimes evident. Pyrenes 6, elliptic in outline, 3 mm. long, 1 mm. wide, the dorsal surface rough, 3-striate, esulcate, the sides smooth, the endocarp coriaceous.

CHINA: Kweichow: Tuh-shan, *Y. Tsiang* 6750 (NY). Kwangtung: Fang-ch'eng, *W. T. Tsang* 26658 (A). Kwangsi: Me-kon, Seh-feng-dar-shan, *R. C. Ching* 3867 (LU, NY), 7822 (NY); Lu-chen, *R. C. Ching* 5862 (LU, NY); Foo-lung, *H. Y. Liang* 69675 (A); Yung-hsien, *Steward & Cheo* 760 (TYPE, A; NY), 1082 (A, NY); Shang-sze, Shap-man-tai-shan, *W. T. Tsang* 2234 (A), 22519 (A), 22687 (A, LU), 23874 (A, NY), 23973 (A, NY), 24588 (A, NY); Young-yuen, *T. S. Tsoong* (*Chan Men* on field label) 82145 (A).

INDO-CHINA: Tonkin: *A. Pételot* 3868 (NY); Ha-coi, Taai-wong-mo-shan, *W. T. Tsang* 26989 (A), 29240 (A); Dan-ha, Sai-wong-mo-shan, *W. T. Tsang* 29810 (A).

The description of the pistillate flower is drawn from *Tsang* 29810.

Ilex stewardii is endemic to the high mountains between Kwangtung, Kwangsi, and Indo-China, and grows as a shrub in woods or forests. It flowers in late June or July. The fruit is still green in August, turning red in November.

The sparsely puberulous slender quadrangular branchlets, the chartaceous entire leaves with prominent lateral nerves, the fasciculate or pseudopaniculate inflorescences, the cymose branches of the infructescence, and the small fruits of *Ilex stewardii* suggest close relationship with *Ilex hainanensis* Merr., but the latter has ovate-obovate or oblong leaves with abrupt and short-acuminate apex and dorsally canaliculate pyrenes.

This species is named after the collector of the type, Prof. A. N. Steward of the University of Nanking, my first botany teacher.

87. *Ilex pubescens* Hook. & Arn. Bot. Beechey Voy. 167, *pl.* 35. 1833; Steud. Nomencl. ed. 2, 1: 802. 1840; Benth. Fl. Hongk. 65. 1861; Maxim. in Mém. Acad. Sci. St. Pétersb. VII, 29(3): 40. 1881; Forbes & Hemsl. in Jour. Linn. Soc. Bot. 23: 117. 1886; Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 356 (Monog.

Aquif. 1: 356). 1901; Dunn & Tutchner in Kew Bull. Misc. Inf. Add. Ser. 10: 59. 1912; Yamamoto, Suppl. Ic. Pl. Form. 1: 39. 1925; Rehd. in Jour. Arnold Arb. 7: 157. 1927; Groff in Lingnan Sci. Bull. 2: 64. 1930; McClure in Lingnan Sci. Bull. 3: 25. 1931; Belval, Mus. Heud. Not. Bot. Chin. 2: 21. 1933; Hand.-Mzt. Symb. Sin. 7: 658. 1933.

Ilex trichoclada Hayata, Ic. Pl. Form. 3: 56. 1913.

A hirsute evergreen shrub up to 3 m. high (tree up to 17 m. high, ex Handel-Mazzetti), with slender subquadrangular branchlets, elliptic chartaceous or membranaceous subentire or argutely pauciserrate leaves, fasciculate inflorescences, 6–8-merous flowers, styliiferous ovary, shortly pedicellate globose fruit with capitate stigma and 6 or 7 pyrenes, 3-striate on the back.

Branchlets slender, somewhat zigzag, cinereous; third year's growth 3 mm. in diameter, subterete, longitudinally ridged and rugose, puberulent, the lenticels lacking, the leaf-scars small, nearly crescent-shaped, slightly elevated; second year's growth 2 mm. in diameter, hirsute, longitudinally ridged, appearing subquadrangular; current year's growth 1 mm. in diameter, longitudinally ridged and canaliculate, villose, the terminal buds often poorly developed or lacking. Leaves occurring also on second year's growth, 2–5 mm. apart; stipules acute, deltoid, callose, hirsute, persistent; petioles 2.5–5 mm. long, one-thirteenth to one-tenth the length of the lamina, hirsute or hispid; lamina chartaceous or membranaceous, olivaceous or atro-olivaceous, opaque and hirsute especially along the midribs, elliptic or obovate-elliptic, 2–5.5 cm., rarely up to 7 cm. long, 1–2.5 cm., rarely up to 3 cm. wide; obtuse at the base, acute or shortly acuminate at the apex, the acumen 3–7 mm. long, the point cuspidate; margin argute and pauciserrate or subentire; midrib plane or slightly impressed above, elevated beneath, the lateral nerves 4 or 5 pairs, obscure above, evident beneath, anastomosing near the margin, the reticulation of the veinlets obscure on both surfaces. Inflorescences fasciculate or pseudo-paniculate in the pistillate, hirsute, axillary on second year's growth only, with dormant or abortive terminal buds, the central axis (when present) 5–6 mm. long, the bracts minute, tricuspidate or deltoid, acute with 2 stipule-like appendages. Staminate inflorescences: individual branches of the fascicles uniflorous, rarely 3-flowered cymose, the pedicels 1–2 mm. long, with 2 minute basal prophylla; peduncles when present 1 mm. long; flowers 4- or 5-merous; calyx patelliform, 2 mm. across, deeply 5- or 6-lobed, the lobes ovate-deltoid, villose, eciliate; corolla 4–5 mm. across, the petals 4–6, ovate-oblong or obovate, 2 mm. long, 1.75 mm. wide, eciliate, one-sixth connate at the base; stamens three-fourths the length of the petals, the anthers oblong, 0.8 mm. long; rudimentary ovary pulvinate, the apex shortly rostellate. Pistillate inflorescences: individual branches of the fascicles 1- or rarely 3-flowered; pedicels 2–3 mm. long, the peduncles of 3-flowered cymes, 1–1.5 mm. long; flowers 6–8-merous; calyx 2.5 mm. across, deeply 6- or 7-lobed, the lobes acute, hirsute; corolla rotate, the petals 5–8, oblong, 2 mm. long; staminodes one-half the length of the

petals, the sterile anthers sagittate; ovary ovoid, 1.5 mm. long, 1.25 mm. wide, glabrous, the style evident, the stigma capitate or thick-discoid. Fruit globose, 4 mm. in diameter, the persistent calyx explanate, the style often evident, the stigma thick-discoid or capitate. Pyrenes 6, rarely 5 or 7, elliptic in outline, the ends pointed, 3 mm. long, 1 mm. wide, the dorsal surface roughened, 3-striate-esulcate, the sides smooth, estriate, the endocarp thick-coriaceous or sublignescens.

CHINA: Anhwei: Wu-yuen, K. Ling 7863 (A). Chekiang: Tih-tai-shan, R. C. Ching 1372 (A, US); Sia-chu, R. C. Ching 1716 (A, LU, US); Yen-tand, H. H. Hu 192 (A); Siu-chang-hsien, H. H. Hu 481 (A), Tsing-tai, Y. L. Keng 91 (A). Kiangsi: Tai-an-hong, J. L. Gressitt 1584 (A); Tung-ku, Y. K. Hsiung 6160 (A); Swe-chuen-hsien, H. H. Hu 844 (A); Kien-nan, S. K. Lau 3932 (A, US), 4395 (A, US); Tsoong-jen, Y. Tsiang 10129 (NY), 10217 (NY); T. H. Wang 185 (A), 341 (A). Fukien: Hing-hua, H. H. Chung 990 (A, LU); Min-how-hsien, H. H. Chung 2093 (A); Yen-ping, H. H. Chung 3266 (A, LU), 3356 (A), 3369 (A); Foochow, H. H. Chung 3710 (A), 3726 (A), 5284 (LU in part, NY), 5406 (A), 6421 (A, LU), 6906 (A), 7820 (A), 8009 (A); O. Warburg 5963 (A); Ing-hok, H. H. Chung 7731 (A, LU), 7974 (A, LU), 7983 (A); S. G. Tang 5976 (A), 6986 (A), 16544 (LU), 16571 (LU); Kudien, H. H. Chung 7922 (A, LU); Gang-ken, J. L. Gressitt 1722 (A). Kwangtung: Ta-ching, W. Y. Chun 5521 (A); Bei-shen, W. Y. Chun 5659 (A); Chang-kiang, W. Y. Chun 5810 (A); Pan-lung-tsze, W. Y. Chun 6109 (A); Teng-wu-shan, W. Y. Chun 6377 (A, US); C. O. Levine (CCC 2026, A); Wat-shui-shan, W. Y. Chun 7385 (A); Tsang-shing, H. Fung 405 (LU 18910, NY); Handel-Mazzetti 905 (A); Canton, C. O. Levine (CCC 616, A, US), 687 (US), 1770 (US), 1934 (A), 3173 (A); Wung-yuen, S. K. Lau 650 (A, NY); Kao-yao, S. K. Lau 20137 (NY); Loh-fou Mountain, H. T. Ho 60172 (NY); E. D. Merrill, 10298 (A), 11123 (A); Y. Tsiang 1646 (A); Yao-shan, S. S. Sin 9058 (NY), 9366 (NY), 9766 (NY), 11172 (NY); Tseng-shing, W. T. Tsang 20307 (NY); Loh-chang, W. T. Tsang 20779 (A, NY); Ta-pu, W. T. Tsang 21160 (A), 21737 (A); Jen-hwa, W. T. Tsang 26459 (A); Lo-chong, Y. Tsiang 1276 (A), 1416 (A), C. L. Tso 20298 (NY), 20403 (NY); Sun-yi, Y. Tsiang 2731 (A); Wai-yang, T. M. Tsui 125 (A, US); Ying-Tak, T. M. Tsui 314 (NY), 350 (NY); Yang-shan, T. M. Tsui 641 (NY); Kau-mo-shan, Wang 365 (A); Ou-chien-kieng, Wang 527 (A). Kwangsi: Sun-to, W. T. Tsang 23033 (A). Hongkong: Beechey (fragment of type, A); W. Y. Chun 4902 (A), 4942 (A), 6579 (A), 6586 (A), 6588 (A), 6694 (A); Faber 9065 (A); C. Ford (NY); Mrs. L. Gibbs 7498 (A); T. N. Liou 809 (NY); Reeves (CB); C. S. Sargent in 1903 (A); Y. Tsiang 163 (A), 2957 (NY); C. Wright in 1853-55 (NY, US). Lantau Island: W. T. Tsang 16597 (A); C. L. Tso 20100 (A). Taiwan: Shin-ten, U. Fairie 416 (A); Lake Candidius, J. L. Gressitt 207 (A, NY), 216 (A, NY); South Cape, A. Henry 254 (NY); R. Kanehira 21329 (A); Tai-hu, Y. Kudo in 1929 (A); Nanto, E. H. Wilson 9972 (A), 11184 (A, US); Taihoku, E. H. Wilson 10251 (A), 10271 (A, US). Without precise locality, A. Henry (NY); Y. Yamamoto in 1929 (TU).

All of Wilson's numbers were originally labeled *Ilex trichoclada* Hayata. Chung 5284 is a mixture of specimens. In New York Botanical Garden

it is called *Ilex pubescens*. In the Arnold Arboretum it is called a *Vaccinium*.

Ilex pubescens has a very wide range of distribution in the warm temperate and sub-tropic southeastern China. There it grows as a shrub or small tree in thickets and woods. Its pinkish flowers appear in May. The fruit becomes red in October.

The hirsute indumentum, the chartaceous or membranaceous leaves, the 4-6 or even 7-merous flowers, the short stamens, and the shortly pedicellate fruits of *Ilex pubescens* indicate relationship with the deciduous Japanese *Ilex serrata* Thunb. var. *sieboldi* (Miq.) Rehd., but the latter has solitary inflorescences in the axils of the leaves of the current year's growth, and these are always found behind the axillary buds. Moreover, in the case of the latter entity the calyx is ciliate and the pyrenes are smooth. The subquadrangular branchlets, the fasciculate or pseudopaniculate inflorescences, the deeply lobed eciliate and erose calyx, and the small subglobose fruit of *Ilex pubescens* also indicate close relationship with *Ilex hainanensis* Merr., but the latter species has oblong or obovate glabrous leaves, dorsally canaliculate pyrenes and nearly glabrous branchlets.

87a. *Ilex pubescens* var. *kwangsiensis* Hand.-Mzt. in *Sinensia* 3(8): 189. 1933.

Branchlets densely villose; leaves thick-chartaceous, brunneous-olivaceous, villose, oblong or obovate, 4-8 cm. long, 2-7 cm. wide, the base obtuse or rarely cuneate, the apex abruptly acuminate; inflorescences pseudopaniculate, usually with active terminal buds; fruit globose, 3 mm. in diameter, the persistent calyx ciliate; pyrenes 6 or 7, 2.25 mm. long, 0.8 mm. wide, roughened on the dorsal surfaces, 3-striate-esculate, the endocarp coriaceous.

CHINA: Kwangsi: Ba-ka-shan, W. Po-seh, *R. C. Ching* 7403 (NY, ISOSYNTYPE), 7522 (NY, ISOSYNTYPE); Lin-yuin-hsien, *Steward & Cheo* 662 (A, NY).

This variety differs from typical *Ilex pubescens* in having larger leaves with an abruptly acuminate apex, numerous prominent veins, and smaller fruits and pyrenes.

Ilex pubescens var. *kwangsiensis* is isolated in western Kwangsi. There it grows as a shrub up to 4 m. high, where the white flowers appear in June.

In the form of the leaf and the venation, this variety resembles *Ilex hainanensis* Merr. more than *Ilex pubescens*. The ciliate calyx of this variety resembles that of *Ilex serrata* Thunb. var. *sieboldii* (Miq.) Loes. Our specimens appear to be very poorly selected and do not seem to represent normal growth. More adequate material may prove that the plant deserves the rank of a species.

88. *Ilex hainanensis* Merr. in *Lingnan Sci. Jour.* 13: 60. 1934; Tanaka & Odashima in *Jour. Soc. Trop. Agr.* 10: 372. 1938; Masamune Fl. Kainant. (Hainan) 174. 1943.

Ilex rotunda Thunb. var. *hainanensis* Loes. in *Nov. Act. Acad. Caes. Leop.-*

Carol. Nat. Cur. 78: 108 (Monog. Aquif. 1: 108). 1901. *Syn. nov.*

An evergreen tree up to 5 m. high with slender, considerably ridged, sparsely puberulous branchlets, broad-elliptic, obovate- or ovate-oblong leaves, fasciculate inflorescences, 5- or 6-merous flowers, and globose fruits with dorsally canaliculate pyrenes.

Branchlets rather zigzag, longitudinally ridged, castaneous or brown, the older portion cinereous; third year's growth 2.5–3 mm. in diameter, ridged, subquadrangular, rugose, glabrescent, the lenticels lacking, the leaf-scars narrowly crescent-shaped, much elevated; second year's growth 1.5–2 mm. in diameter, considerably ridged, sparsely puberulous; current year's growth 1 mm. in diameter, deeply and longitudinally canaliculate, sparsely and distinctly puberulous, the terminal buds very thin, usually poorly developed and abortive. Leaves occurring also on the second year's growth, 5–12 mm. apart; stipules callose, acute-deltoid, 1 mm. long; petioles 5–10 mm. long, one-tenth to one-fifth the length of the lamina, deeply and narrowly canaliculate above, puberulous in the grooves only; lamina thin-coriaceous or chartaceous, olivaceous or castaneous-olivaceous, opaque or slightly shiny above, opaque beneath, broad-elliptic, obovate- or ovate-oblong, 3–7 cm. long, 1.5–2.5 cm. wide; obtuse at the base; abruptly short-acuminate at the apex, the acumen 3–7 mm. long, the tip acute or mucronate; margin entire, very rarely 1- or 2-toothed near the apex; midrib deeply impressed and minutely puberulous above, elevated and glabrous beneath, the lateral nerves ca. 10 pairs, prominent on both surfaces, the reticulation of the veinlets prominent beneath. Inflorescences fasciculate or pseudopaniculate, on second year's growth, with active or abortive terminal buds, the central axis 4 mm. long, sparsely puberulous, the bracts deltoid, acute, often deciduous. Staminate inflorescences: individual branches of the fascicles 1–5-flowered, subumbelliform; peduncles 1–3 mm. long, the pedicels 1 mm. long with 2 basal prophylla; flowers 5- or 6-merous; calyx patelliform, 2 mm. across, deeply 5- or 6-lobed, the lobes ovate-deltoid, obtuse, erose, eciliate, glabrous; corolla rotate, 5–6 mm. across, the petals ovate, 1.8 mm. long, 1.5 mm. wide, eciliate, one-sixth connate at the base; stamens three-fourths the length of the petals, the anthers oblong, 1 mm. long; rudimentary ovary pulvinate, the apex shortly rostellate. Pistillate inflorescences: individual branches of the fascicles 1–3-flowered cymose; peduncles 1–3 mm. long, the pedicels 3 mm. long, with 2 minute basal prophylla; calyx and corolla as in the staminate flowers; staminodes one-half the length of the petals, the sterile anthers sagittate, with the apex mucronate; ovary ovoid, 1.5 mm. in diameter, glabrous, the stigma thick-discoid, lobed. Fruit subglobose-ellipsoid, 4 mm. long, 3 mm. in diameter, when dry longitudinally sulcate, the persistent calyx subexplanate, 3 mm. across, the lobes deltoid, 1 mm. long, obtuse, the stigma thick-discoid or capitate, the style sometimes evident. Pyrenes 6, rarely 5, elliptic in outline, the ends pointed, 3 mm. long, 1 mm. wide, the dorsal surface roughened and canaliculate, the sides smooth, the endocarp subwoody.

CHINA: Kwangsi: Foo-lung, Sup-man-ta-shan, *H. Y. Liang* 69676 (A). Hainan: Ling-shui, *H. Fung* 20086 (ISOTYPE, A; TYPE, NY); without precise locality, *A. Henry* in 1889 (type of *Ilex rotunda* var. *hainanensis*, fragment, A); Yai-chow, *F. C. How* 70697 (A, NY, US); E. Wong Mountain, *H. Y. Liang* 63663 (A, NY); Bak-sa, *S. K. Lau* 26322 (A), 26327 (A); Lok-tung, *S. K. Lau* 27433 (A).

Ilex hainanensis was first described from Hainan Island as a small-leaved tree growing in woods. The pink flowers appear in April or May. Similar plants have been recently collected in the high mountains of southeastern Kwangsi.

The subquadragonal branchlets, the fasciculate inflorescences, the 5- or 6-merous flowers, the short stamens, the rostellate rudimentary ovary, the small fruits, and the elliptic subnigified pyrenes of *Ilex hainanensis* indicate a very close relationship with *Ilex pubescens* Hook. & Arn., but the latter has hirsute branchlets, subentire or pauciserrate leaves, and 3-striate esulcate pyrenes. By the entire shortly acuminate leaves and the small subglobose fruit one may be misled into relating the species to *Ilex rotunda* Thunb. But the latter can easily be distinguished by its simple cymose inflorescences in the leaf-axils of the current year's growth only. Though rarely, it does sometimes happen that some of the active terminal buds of the fasciculate inflorescences of *Ilex hainanensis* do develop into leafy shoots with crowded cymose or subumbelliform inflorescences in the axils of the scales or even of the lower leaves at their bases. Even in such cases the identity of the species can be recognized by the large number of fasciculate inflorescences.

SERIES 2. SIDEROXYLOIDES (LOES.), STAT. NOV.

Ilex subgen. *Euilex* ser. *C. Aquifolium*, sect. *Microdontae*, subsect. *Sideroxyloides* Loes. in Engler & Prantl, Nat. Pflanzenfam. Nachtr. 220. 1897, et in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 349 (Monog. Aquif. 1: 349). 1901.

Leaves entire, thick-coriaceous, coriaceous or subcoriaceous, olivaceous or griseo-olivaceous, rarely slightly brunneous-olivaceous; inflorescences axillary, fasciculate, the staminate fascicles composed of single-flowered pedicels or 3-flowered cymes, the pistillate fascicles of 1-flowered pedicels; fruits globose, the diameter smaller than the length of the pedicels, the stigma prominent, columnar or capitate, the style often distinct, the persistent calyx larger than half the diameter of the fruits; pyrenes 4-7, striate but not sulcate, the striae loosely attached to the coriaceous smooth endocarp.

KEY TO THE SPECIES

- A. Leaves not glandular-punctate, the apex obtuse, acute, or acuminate.
- B. Branchlets pilose; leaves linear-lanceolate or oblanceolate, 5-15 mm. wide; individual branches of the pistillate fascicles 1-3-flowered, the flowers 5-8-merous. (Hupei-Kwangsi)..... 89. *I. metabaptista*.

- BB. Branchlets glabrous or puberulous; leaves ovate, oblong, elliptic or obovate, usually over 2 cm. wide; individual branches of the pistillate fascicles uniflorous.
- C. Branchlets and petioles glabrous; individual branches of the staminate fascicles always uniflorous; exocarp of the fruit coriaceous; pyrenes unistriate on the back. (Central China)..
.....90. *I. elmerrilliana*.
- CC. Branchlets and petioles puberulous; individual branches of the staminate fascicles 1-3-flowered, rarely more; exocarp of the fruit membranaceous.
- D. Leaves thick-coriaceous; lateral nerves 7-8 on each side of the midrib, indistinct; pyrenes 4 or 5. (Hongkong and South China).....91. *I. memecylifolia*.
- DD. Leaves coriaceous; lateral nerves 11-14 on each side of the midrib, evident beneath; pyrenes 6 or 7. (Yunnan)..
.....92. *I. sinica*.
- AA. Leaves glandular-punctate, the apex rounded and emarginate, or acuminate with retuse, obtuse, or acute tips.
- B. Leaves thick-coriaceous, obovate; apex rounded and strongly emarginate or rarely obtuse. (Kwangtung).....93. *I. titcheri*.
- BB. Leaves coriaceous or subcoriaceous, linear, oblong or elliptic; apex acuminate, the tip retuse or obtuse, rarely acute.
- C. Leaves linear-lanceolate, less than 2.5 cm. wide; individual branches of staminate fascicles cymose, the peduncles 8-10 mm. long, 3 or 4 times as long as the pedicels. (Kwangsi and adjacent provinces).....94. *I. salicina*.
- CC. Leaves ovate-oblong or oblong-elliptic, averaging 4 cm. wide; peduncles of the staminate flowers variable.
- D. Pedicels of the fruit 28-32 mm. long; leaves very large, 18-25 cm. long, 6-7 cm. wide; petioles comparatively short, ca. one-twentieth the length of the lamina. (Hainan).....95. *I. dolichopoda*.
- DD. Pedicels of the fruit 5-9 cm. long; leaves less than 16 cm. long and less than 5 cm. wide.
- E. Peduncles of the staminate flowers more or less equaling the pedicels in length; stigma of the fruit navel-like; pedicels 5-8 mm. long; leaves ovate-oblong, rarely elliptic, 4.5-9 cm. long, brunneous; the apex abruptly acuminate, the tip retuse.
- F. Flowers 5-8-merous; branchlets glabrous. (Kwangtung and Hainan)..96. *I. kobuskiana*.
- FF. Flowers 4-merous, rarely the calyx 5-lobed; branches puberulous. (Kwangsi).....
.....97. *I. retusifolia*.
- EE. Peduncles of the staminate flowers three times as long as the pedicels; stigma on fruits columnar-mammiform; pedicels 8-15 mm. long; leaves elliptic or oblong-elliptic, olivaceous; the apex never retuse. (Taiwan, Hainan, Indo-China).....
.....98. *I. cochinchinensis*.

89. *Ilex metabaptista* Loes. ex Diels in Bot. Jahrb. 29: 435. 1900, nom. nud., in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 238 (Monog. Aquif. 1: 238). 1901, descr., et in Sarg. Pl. Wils. 1: 78. 1911; Chun in Sunyats. 4: 224. 1940.

A pilose evergreen shrub or small tree up to 4 m. high with small lanceolate to oblanceolate subentire leaves, fasciculate inflorescences, columnar stigma, and 5-8 striate coriaceous pyrenes.

Branchlets pilose, older ones cinereous; younger parts castaneous; third year's growth 4 mm. in diameter, longitudinally striate-rugose, the lenticels sparse and inconspicuous, orbicular, the leaf-scars semi-orbicular, closely associated with the scars of the inflorescence; second year's growth 3 mm. in diameter, ridged below the attachment of the leaves, the lenticels often evident; current year's growth 2 mm. in diameter, ridged and canaliculate, pilose; terminal buds (when present) lanceolate, conic, very pilose. Leaves occurring also on second year's growth, 2-12 mm. apart; stipules minute, callose, broadly deltoid, pilose; petioles 3-8 mm. long, one-twelfth to one-eighth the length of the lamina, canaliculate above, pilose; lamina subcoriaceous, olivaceous or brown, lanceolate to oblanceolate, 3-8 cm. long, 5-15 mm. wide, pilose along the margin, lower surface, and midrib above; base acute or cuneate, narrowly decurrent; apex acute or obtuse and minutely apiculate; margins subentire, often minutely 1-2-toothed near the apex, pilose, when dry revolute; midrib impressed and pilose above; elevated beneath, the lateral nerves 6-8 on each side, obscure or on older leaves slightly impressed above, prominent beneath, the reticulations obscure. Inflorescences fasciculate, axillary, sessile, on second year's growth, hirsute, the persistent bud-scales minute, callose, broadly deltoid, 0.5 mm. long. Staminate inflorescences: individual branches of the fascicles 3-flowered, cymose, the bracts very small, tricuspidate; the peduncles 3-6 mm. long, the pedicels 1.5-2.5 mm. long, the bracteoles 0 or 1, basal; flowers white, 5- or 6-merous; calyx cyathiform, 3 mm. across, deeply 5- or 6-lobed, the lobes deltoid-ovate, obtuse, pilose, ciliate; corolla rotate, 5-6 mm. across, the petals oblong-ovate, 2 mm. long, eciliate; stamens slightly shorter than the petals, the anthers oblong, 0.75 mm. long; rudimentary ovary pulvinate, sulcate, the apex shortly acute. Pistillate inflorescences: individual branches of the fascicles uniflorous, rarely 2- or 3-flowered cymose; pedicels 4-5 (after fruiting up to 7) mm. long, with 0-2 median or rarely basal or supermedian prophylla; peduncles of occasional cymes 5-6 mm. long, the pedicels 3 mm. long; flowers 5-8-merous; calyx cyathiform, 3-4 mm. across, deeply 6-lobed, the lobes deltoid, hirsute and ciliate; corolla rotate, 6 mm. across, the petals oblong, 2 mm. long; staminodes two-thirds as long as the petals, the sterile anthers sagittate; ovary ovate-subpyramidal, the style evident, the stigma columnar, pubescent. Fruit ovoid-ellipsoid, 5-6 mm. long, 4-5 mm. in diameter, the persistent calyx subexplanate or patelliform, 4 mm. across, pilose and ciliate, the stigma columnar. Pyrenes 5-8, elliptic

in outline, 3.5–4 mm. long, 1.25 mm. wide, the ends pointed, the dorsal surface striate, esulcate, the endocarp coriaceous.

CHINA: Hupei (Hupeh): Pa-tung-hsien, *H. C. Chow* 579 (material for the description of the pistillate flowers) (A), 579A (NY); Ichang, *A. Henry* 1764 (ISOTYPE, A), 3343 (ISOTYPE, A), 3472 (ISOTYPE, A); Changyang-hsien, *E. H. Wilson* 138 (A), 756 (A, US); without precise locality, *E. H. Wilson* 866 (NY), 866A (A, NY, US), 866B (A). Kweichow: Wha-chou, Tsingchen, *S. W. Teng* 90386 (A); Kwei-ling, *Y. Tsiang* 5629 (NY). Kwangsi: Kiang-kou-hsien, *Steward, Chiao & Cheo* 950 (A, NY, US); Nam-tan-yuen, *C. Wang* 40931 (A).

Ilex metabaptista was first described from material collected from western Hupei. There it grows as a shrub at altitudes of 300–600 m. and flowers in April. The corollas are white. The fruits are red in December. In recent years the plant has been collected in Kweichow and Kwangsi. The Kweichow specimens are less hairy. So far as our material goes, the species appears to be distributed in a narrow band extending north and south along the Hupei-Hunan-Kweichow-Kwangsi border.

The narrowly lanceolate subentire leaves, the fasciculate inflorescences, the very minute bracts, the prominent columnar stigma, and the striate esulcate coriaceous pyrenes indicate close relationship with *Ilex salicina* Hand.-Mzt. That species, however, has punctate leaves.

89a. *Ilex metabaptista* var. *myrsinoides* (H. Lévl.) Rehd. in Jour. Arnold Arb. 14: 240. 1933.

Maesa myrsinoides H. Lévl. in Fedde, Rep. Spec. Nov. 10: 375. 1912, et Fl. Kouy-Tchéou 286. 1914.

Myrsine Feddei H. Lévl. in Fedde, Rep. Spec. Nov. 10: 376. 1912, et Fl. Kouy-Tchéou 288. 1914.

Embelia cavaleriei H. Lévl., Fl. Kouy-Tchéou 284. 1914.

Ilex fargesii var. *Bodinieri* Loes. apud H. Lévl., Fl. Kouy-Tchéou 200. 1914.

Branchlets cinereous, the current year's growth almost glabrous; leaves lanceolate or oblanceolate, subentire, often with 1–3 teeth near the apex, glabrous except the midrib above; inflorescences fasciculate, very sparsely and minutely puberulent; calyx ciliate; corolla rotate; rudimentary ovary subglobose, inconspicuously sulcate, the apex mucronate.

CHINA: Kweichow: *J. Cavalerie* 579 (TYPE of *Maesa myrsinoides* (K; photo, A; fragment, N.Y.); *E. Bodinier* 2310, in part (TYPE of *Ilex fargesii* var. *bodinieri*, fragment and photo, A), 842 (TYPE of *Myrsine feddei*, fragment, A); *J. Cavalerie* in Herb. E. Bodinier 2635 (TYPE of *Embelia cavaleriei*, fragment, A); *S. W. Teng* 90386B (A); *Y. Tsiang* 8525 (A).

This variety occurs in Kweichow on the western flank of the range of *Ilex metabaptista*. Its white flowers appear in May.

This variety differs from the typical *Ilex metabaptista* in having less puberulent branchlets, leaves, and inflorescences. Since the change in the indumentum is so gradual, it might be better to consider this as merely a form rather than as worthy of varietal rank.

90. *Ilex elmerrilliana*, sp. nov.

Ilex memecylifolia sensu Rehd. in Jour. Arnold Arb. 8: 157. 1929, non Champ.

Frutex vel arbor parva, glaberrima; foliis crasse coriaceis, oblongo-ellipticis, 5–9 cm. longis, 2–3.5 cm. latis, basi cuneatis vel acutis, apice breviter acuminatis (acumine deltoideo 6–8 mm. longo) margine integerimis, costa supra impressa, glabra, subtus elevata, nervis lateralibus obsoletis; inflorescentiis pseudofasciculatis, unifloris; pedicellis 5–10 mm. longis; floribus 5–8-meris, calycibus 3.5 mm. diametro, eciliatis; corolla 7–8 mm. lata, petalis eciliatis; staminibus quam petalis paullo brevioribus, glabris; fructibus globosis, 5 mm. diametro, stylis prominentibus 1 mm. longis, stigmatibus columnaribus; pyrenis 6 vel 7, levibus, oblongis, 3.5 mm. longis, 1-striatis, striis rimosis.

An evergreen shrub or small tree up to 5 m. high with glabrous branchlets, thick-coriaceous, oblong-elliptic entire leaves, pseudofasciculate inflorescences, globose fruit with a columnar stigma and 6 or 7 pyrenes with smooth coriaceous endocarp and a single branched longitudinal median ridge.

Branchlets rather stout, the third year's growth 3–4 mm. in diameter, longitudinally rimulose, the lenticels numerous, elliptic, inconspicuous, the leaf-scars semicircular, slightly elevated; second year's growth 3 mm. in diameter, longitudinally ridged and rugose, the lenticels lacking; current year's growth angular and ridged, 2 mm. in diameter, glabrous; the terminal buds narrowly conic, the scales very loose, glabrous, ciliate, with prominent stipule-like appendages. Leaves found even on third year's growth, 10–20 mm. apart; stipules narrowly deltoid, persistent; petioles 4–8 mm. long, ca. one-tenth the length of the lamina, glabrous, deeply grooved above, rugose beneath; lamina thick-coriaceous, olivaceous, shiny above, opaque beneath, elliptic or oblong-elliptic, 5–9 cm. long, 2–3.5 cm. wide; cuneate or acute at the base; abruptly acuminate at the apex, the acumen 6–8 mm. long, broadly deltoid; margin entire, when dry slightly recurved; midrib narrowly impressed and glabrous above, elevated beneath, the lateral nerves inconspicuous on both surfaces. Inflorescences pseudofasciculate, the fascicles with persisting or abortive terminal buds, the individual branches uniflorous; bracts ovate, glabrous; flowers 5–8-merous. Staminate inflorescences: pedicels 5–10 mm. long, glabrous, with 0–2 sub-basal prophylla; calyx patelliform, 3.5 mm. across, 6–8-lobed, the lobes deltoid, acute-acuminate, eciliate; corolla rotate, 7–8 mm. across, the petals oblong, 3.5 mm. long, eciliate, one-fourth connate at the base; stamens nearly as long as the petals, glabrous, the anthers ovoid-oblong; rudimentary ovary conic, the apex obtuse, inconspicuously lobed. Pistillate flowers not seen (the staminode attached to certain young fruits glabrous). Fruit globose, 5 mm. in diameter, the persistent calyx explanate, 4 mm. across, the lobes acute, the style prominent, 1 mm. long, the stigma columnar. Pyrenes 6 or 7, oblong, in cross-section trigonous, 3.5 mm. long, 1.5 mm. wide, the endocarp coriaceous, smooth, with a single slender ridge on the back, slightly branched towards the lower end.

CHINA: Anhwei: Wu-yuan: *R. C. Ching* 3307 (A, LU). Chekiang: without precise locality, *R. C. Ching* 1368 (A); Tih-tai-shan, *R. C. Ching* 1368A (US). Wenchow: *R. C. Ching* 1861 (A, LU, US); Tsing-tien, *Y. L. Keng* 82 (A); Chin-yuen-hsien (Herb. Nat. Chek. Univ. D 189), (LU). Fukien: central Fukien, *Dunn* (ex Hongkong Herb. no. 2471) (A); Yen-ping, *H. H. Chung* 3447 (A). Kiangsi: Tung-ku, *Y. K. Hsiung* 6156 (A). Yi-fong: *Y. K. Hsiung* 6433 (A); Lung-nan, *S. K. Lau* 4410 (TYPE, A; US), 4776 (A, US).

This is a shrub or a tree growing in thickets and forests. The largest tree, according to data on the labels, is 16 m. high. Its white flowers appear in May.

In the form and texture of the leaves *Ilex elmerrilliana* is very similar to *Ilex memecylifolia* Champ. ex Benth., but the latter has puberulent branchlets, pubescent staminodes, and 4 or 5 reticulately striate woody pyrenes. The species is named in honor of Professor Elmer D. Merrill.

91. *Ilex memecylifolia* Champ. ex Benth. in Hook. Jour. Bot. Kew Gard. Miscel. 4: 328. 152; Walp., Annal. 4: 430. 1857; Benth., Fl. Hongk. 65. 1861; Maxim. in Mém. Acad. Sci. St. Pétersb. VII. 29: 37. 1881; Forbes & Hemsl. in Jour. Linn. Soc. Bot. 23: 117. 1886; Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 350 (Monog. Aquif. 1: 350). 1901; Dunn & Tutcher in Kew Bull. Add. Ser. 10: 60. 1912; Pitard in Lecomte, Fl. Gén. Indo-Chine 8: 852. 1912.

Ilex memecylifolia var. *oblongifolia* Champ. op. cit. 329. 1852; Loes. op. cit. 351. 1901.

An evergreen shrub up to 2 m. high with puberulent branchlets, ovate-oblong or obovate entire leaves, pseudofasciculate inflorescences, styliferous ovary, pubescent staminodes, globose fruits, each with a columnar stigma and 4 or 5 reticulately striate esulcate pyrenes.

Branchlets slender, third year's growth 2 mm. in diameter, smooth, the lenticels lacking, the leaf-scars semicircular, much elevated; second year's growth more slender, longitudinally wrinkled when dry; current year's growth 1 mm. in diameter, minutely puberulent, the terminal buds broadly ovoid, puberulent. Leaves occurring also on second year's growth, 8–17 mm. apart; stipules obliquely deltoid; petioles 5–7 mm. long, about one-eighth the length of the lamina, puberulent, narrowly canaliculate above; lamina thickly coriaceous, griseous- or brunneous-olivaceous, rather opaque on both surfaces, ovate-oblong or rarely obovate, 3.5–8.5 cm. long, 1.4–3.5 cm. wide, cuneate at the base; shortly and abruptly acuminate at the apex, the acumen 2–8 mm. long; margin entire; midrib puberulent and deeply impressed above, elevated beneath, the lateral nerves inconspicuous. Inflorescences pseudofasciculate, axillary on the second year's growth, the central axis 1–5 mm. long with a dormant or active terminal bud; flowers 4–6-merous. Staminate inflorescences: individual branches of the fascicles 1–3-flowered, the bracts deltoid, minutely puberulent; peduncles 1–2 mm. long, the pedicels 3–6 mm., rarely 7 mm. long, both puberulent;

the prophylla 0-2, basal or sub-basal; calyx patelliform, 2 mm. across, puberulent, 5- or 6-lobed, the lobes deltoid, obtuse, often erose, ciliate; corolla rotate, 5-6 mm. across, one-sixth connate at the base; petals 4 or 5, oblong, 1-2 mm. long, eciliate; stamens 4 or 5, equaling the petal in length, the anthers ovoid, 0.7 mm. long, glabrous; rudimentary ovary subglobose, apical end inconspicuously lobed. Pistillate inflorescences: individual branches of the fascicles uniflorous; pedicels 6-8 mm. long, with 1 or 2 basal prophylla; calyx and corolla as in the staminate flower; staminode three-fourths as long as the petals, both the filament and the sterile anthers puberulent; ovary subglobose-ovoid, 1.5-2 mm. in diameter, the style evident, 1 mm. long, the stigma capitate. Fruit globose, 6 mm. in diameter, the persistent calyx explanate, 3 mm. across; stigma columnar, pyrenes 4 or 5, reticulately striate, elliptic-trigonus, 5 mm. long, 2 mm. wide on the back, the endocarp coriaceous, rough and hairy.

CHINA: Kwangtung: Heung-shan, K. P. To (CCC) 2235 (LU, NY); Hung-tung, S. S. Sun 9825 (NY). Hongkong: M. Bon 344 (P); *Champion* (fragment from TYPE, A); W. Y. Chun 5070 (A), 6094 (A), 6989 (NY); J. Esquirol 1299 (P); F. B. Forbes 83 (B), 178 (B); C. Ford in 1879 (A, NY, US), in 1893 (A, NY, US); Mrs. Gibbs (ex Herb. Hongkong no. 10259) (A); Hance (G), 573 (NY); Y. W. Taam 1509 (A); W. T. Tsang 29656 (A); Y. Tsiang 152 (A, NY), 235 (A), 267 (A), 280 (A, US), 302 (A); Wilford (G); C. Wright 98 (G, NY, US). Kouloun City: D. T. Dunn 46 (A). Kwangsi: Shang-sze, W. T. Tsang 22116 (A, LU).

Except for a collection from southeastern Kwangsi, *Ilex memecylifolia* is known only from Hongkong Island. There it grows as a shrub on dry slopes, in thickets and woods, and also along roadsides. It blooms in April. The flowers are white and fragrant (Tsang).

In leaf form and leaf texture *Ilex memecylifolia* is closely related to *Ilex elmerrilliana* S. Y. Hu, but the latter differs in having glabrous stems, uniflorous individual branches of staminate fascicles, glabrous staminodes, rostellate rudimentary ovary, and pyrenes with only one branched median longitudinal stria.

The specimen collected by C. Wright at Hongkong has both large (8 cm. long, 3 cm. wide) and small (3 cm. long, 1.5 cm. wide) leaves on a single branch. Thus *Ilex memecylifolia* var. *oblongifolia*, distinguishable by leaf size only, is not worthy of recognition.

92. *Ilex sinica* (Loes.), comb. nov.

Ilex malabarica Bedd. var. *sinica* Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 89: 281 (Monog. Aquif. 2: 281). 1908.

An evergreen tree up to 8 m. high with cinereous branchlets, coriaceous opaque bluish-olivaceous oblong entire leaves acuminate at the apex, fasciculate inflorescences, 3-flowered cymose staminate branches, 4-6-merous flowers, long rostellate rudimentary ovaries, small globose fruits, and 6 reticulately striate pyrenes.

Branchlets subterete, third year's growth 3-4 mm. in diameter, the lenticels orbicular, sometimes very conspicuous, the leaf-scars small,

semi-orbicular; second year's growth 2–3 mm. in diameter, puberulous; lenticels sometimes present, inconspicuous; current year's growth 2 mm. in diameter, thickly puberulous, longitudinally striate-sulcate; terminal buds conic, acute, puberulous, the scales loose. Leaves found also on second year's growth, 5–15 mm. apart; stipules scale-like, narrowly deltoid, 1.25 mm. long, acute, puberulous; petioles 5–8 mm. long, about one-twelfth the length of the lamina, puberulous, narrowly canaliculate above; lamina thinly coriaceous, bluish olivaceous, opaque on both surfaces or slightly shiny above, sparsely and minutely puberulous at the base and on the lower surfaces, oblong or oblong-elliptic, (5–)7–10(–13) cm. long, 2.5–4 cm. wide; base obtuse, rarely narrowly so; apex acuminate, the acumen 5–20 mm. long; midrib narrowly and deeply impressed and puberulous above, elevated and puberulous beneath, the lateral nerves 10–14 on each side, obscure or sometimes evident on both surfaces, the reticulations of the veinlets obscure. Inflorescences fasciculate with active or abortive terminal buds, puberulous; bracts lanceolate, 1–2 mm. long, puberulous. Staminate inflorescences: individual branches of the fascicles 3-flowered, cymose, the peduncles and pedicels 3–4 mm. long; flowers 4–5-merous; calyx cyathiform, puberulous, 2–2.5 mm. across, 4–6-lobed, the lobes deltoid, acute, sometimes sparsely ciliate; corolla rotate, 6 mm. across, the petals oblong, eciliate, one-tenth connate at the base; stamens 4, equaling or slightly longer than the petals, the anthers ovate-oblong; staminode slightly shorter than the petals, the sterile anthers cordate, slightly puberulous, the filament glabrous; rudimentary ovary ovoid, 1 mm. in diameter, the apex rostellate, the beak 0.5 mm. long. Pistillate inflorescences: individual branches of the fascicles uniflorous; pedicels 5–6 mm. long, with 2 scale-like basal prophylla; flowers 6–9-merous; calyx 3–4 mm. wide; corolla rotate, 6 mm. across, the petals 6–9; staminodes slightly shorter than the petals, the sterile anthers cordate, slightly puberulous, the filament glabrous; ovary globose, 2 mm. in diameter, the style evident, 0.5 mm. long, the stigma very conspicuous, columnar-capitate, 1 mm. in diameter. Fruit globose, 4 mm. in diameter, the persistent calyx subexplanate, 3 mm. across, the persistent style 1 mm. long, the stigma mammiform. Pyrenes 6, oblong in outline, the ends obtuse, 3 mm. long, 1–1.5 mm. wide, reticulately striate, the endocarp smooth, coriaceous.

CHINA: Kwangsi: Shuen-yuen, T. S. Tsoong (= Z. S. Chung) 81529 (A), 81536 (A). Yunnan: without precise locality, G. Forrest 26644 (A); Mengtze, A. Henry 10471 (A, US); Szemao, A. Henry 12595 (A, NY, ISOTYPE of *Ilex malabarica* var. *sinica*), 12595A (A, US). Fo-hai, C. W. Wang 73659 (A), 73660 (A), 74201 (A).

The descriptions of the staminate and pistillate flowers are drawn respectively from Tsoong 81529 and Forrest 26644.

Ilex sinica was first recorded from Szemao in southeastern Yunnan. Recently collected material from southwestern Yunnan and Kwangsi matches A. Henry's specimens well. In subtropical southwestern China *Ilex sinica* grows as a tree in mixed forests at an altitude of 1500 m. Its

white flowers appear in May. The fruit turns red in November.

Ilex sinica was first published as a variety of *Ilex malabarica* Bedd. I have studied a fragment of Beddome's type and another pistillate specimen from Bombay. These Indian plants do not have styliferous ovaries. Their sterile anthers are glabrous and their leaves have 7 or 8 lateral nerves which are evident on the lower surfaces. In these characters they differ from the geographically remote plant of China and justify treating the latter as a distinct species.

Ilex sinica is closely related to *Ilex memecylifolia* Champ. ex Benth., but it differs from the latter in having larger leaves (average 7–10 cm. long, 3–4 cm. wide), smaller fruits (ca. 4 mm. in diameter) and 6 small pyrenes (ca. 3 mm. long). The leaves of *Ilex memecylifolia* are 4–6 cm. long, 2–3 cm. wide, its fruits 6 mm. in diameter, and its 5 pyrenes 5 mm. long.

93. *Ilex tutcheri* Merr. in Philipp. Jour. Sci. Bot. 13: 143. 1918.

A large glabrous evergreen shrub up to 4 m. high with very thick-coriaceous obovate punctate leaves, rounded and retuse or rarely obtuse apex, completely obsolete lateral nerves, fasciculate inflorescences, long fruiting pedicels (10 mm. long), globose fruit with mammiform stigma and 5 or 6 striate pyrenes.

Branchlets glabrous, terete, brunneous or castaneous; third year's growth 3 mm. in diameter, smooth, the lenticels lacking, the leaf-scars deltoid, elevated; second year's growth slightly thinner, ridged; current year's growth 1.8–2 mm. in diameter, angular, the terminal buds ovoid, with loose glabrous scales. Leaves occurring even on the third year's growth, 3–7 mm. apart; stipules deltoid, acuminate, 1 mm. long, persistent; petioles 4–8 mm. long, about one-sixth as long as the lamina, glabrous and rugose, deeply canaliculate above, narrowly winged on the distal half; lamina thick-coriaceous, olivaceous, shiny above, opaque and punctate beneath, obcordate, obovate or rarely obovate-elliptic, 3–6 cm. long, 1.3–2.5 cm. wide; base acute or cuneate; apex rounded and retuse or rarely obtuse; margin entire, recurved; midrib deeply impressed and very minutely and sparsely puberulous above, prominently elevated and glabrous beneath, the lateral nerves indistinct on both surfaces. Inflorescences fasciculate, axillary, on second and third years' growth; bracts callose, tricuspidate, minutely puberulous; flowers 4–6(–7)-merous. Staminate inflorescences: individual branches of the fascicles 3-flowered, cymose, peduncles 2–3 mm. long, sparsely and minutely puberulous, the pedicels 3–4 mm. long, puberulous, with 0–2 broadly deltoid puberulous basal prophylla; calyx patelliform, rugose or minutely puberulous, 3 mm. across, shallowly 5–7-lobed, the lobes rounded, eciliate or very rarely sparsely ciliate; corolla rotate, 7 mm. across, the petals 4 or 5, oblong, 2.5 mm. long, eciliate, one-tenth connate at the base; stamens nearly as long as the petals, glabrous, the anthers oblong-ovoid; rudimentary ovary globose, papillose, the middle distinctly 4- or 5-lobed. Pistillate flowers not seen. Infructescence: individual branches of the fascicles uniflorous; pedicels 8–10 mm. long, puberulous, with 1 or 2 sub-basal prophylla. Fruit globose, 5 mm. in diameter,

the persistent calyx explanate, 4 mm. across, rounded in outline, the stigma mammiform. Pyrenes 5 or 6 (7 according to Merrill), broad-elliptic in outline, 2–3 mm. long, 1–1.25 mm. wide, smooth, with 2 or 3 elevated striae on the back, the endocarp coriaceous.

CHINA: Kwangtung: Wung-yuen, S. K. Lau 895 (A, NY), 2569 (A); Loh-fau-shan, C. O. Levine (CCC 557) (A); E. D. Merrill 10377 (A, TYPE); Tseng-shing, W. T. Tsang 20346 (A, NY); Lung-moan, W. T. Tsang 20460 (A, NY, US); Ts'ung-hwa, W. T. Tsang 25105 (A); Ho-yuen, W. T. Tsang 28772 (A); Sin-fung, Y. W. Taam 656 (A), 669 (A), 840 (A).

I have seen no material of *Ilex tutcheri* from outside of Kwangtung province. The plant is localized in eastern parts of the province between Long. 113–115 degrees E. and Lat. 23–25 degrees N. It grows in thickets or woods and produces white flowers in May. The fruit becomes red in November.

The long-fruited pedicels and the thick-coriaceous leaves of *Ilex tutcheri* indicate a close relationship with *Ilex memecylifolia* Champ. ex Benth. The latter, however, differs in having shortly acuminate leaves, reticulately striate pyrenes, and epunctate lower leaf-surfaces. *Ilex tutcheri*, in having thick-coriaceous punctate retuse leaves and small striate esulcate pyrenes, shows relationship also with *Ilex championii* Loes., a species which differs in having very short (2–3 mm.) fruiting pedicels.

According to Merrill, the ovary of *Ilex tutcheri* is 6- or 7-celled. Specimens I have seen, however, have 5- or 6-celled ovaries.

94. *Ilex salicina* Hand.-Mzt. in Sinensia 3(8): 187. 1933.

An evergreen shrub with glabrescent branchlets, linear-lanceolate punctate leaves, fasciculate inflorescences, styliiferous ovary, globose fruits and 6 striate pyrenes.

Branchlets very minutely and sparsely puberulent, glabrescent, castaneous; third year's growth 2.5–3 mm. in diameter, longitudinally striate-rugose, the lenticels numerous, conspicuous, the leaf-scars semi-orbicular, elevated; second year's growth 2.5 mm. in diameter, the lenticels numerous; current year's growth 1.75 mm. in diameter, sulcate, very sparsely and minutely puberulent, the terminal buds conic, with loose puberulent scales. Leaves occurring also on the second year's growth, crowded, usually 2–3 mm. (rarely up to 20 mm.) apart; stipules minute, callose, very shortly and broadly deltoid; petioles 6–10 mm. long, about one-tenth the length of the lamina, glabrous, deeply canaliculate above, rugose beneath; lamina coriaceous, linear-lanceolate, 4.5–11 cm. long, 9–23 mm. wide, brunneous-olivaceous, shiny above, opaque and punctate beneath; base cuneate; apex acuminate, the very tip obtuse; margin entire, recurved; midrib impressed and glabrous above, elevated beneath, the lateral nerves 9–12 on each side, indistinct above, evident beneath, near the margin reticulate, the reticulation of the veinlets obscure above, evident beneath. Inflorescences pseudo-fasciculate, axillary on second year's growth, often with abortive terminal buds, rarely with active ones, the central axis up to 6 mm. long, puberulent; the bracts ovate, acute, puberulent,

eciliate; flowers 4-6-merous. Staminate inflorescences: individual branches of the fascicles 1-4-flowered cymose; peduncles 8-10 mm. long, puberulent, the pedicels 2-3 mm. long, with 0-2 basal prophylla; calyx cyathiform, 3 mm. across, puberulent, shallowly 6-lobed, the lobes rounded, ciliate; corolla rotate, ca. 7 mm. across, the petals oblong, 3 mm. long, eciliate, one-tenth connate at the base; stamens equaling the petals in length, the anthers ovoid; rudimentary ovary globose-ovoid, minute, 0.75 mm. long, the apical end obtuse, inconspicuously 4-6-lobed. Pistillate inflorescences: individual branches of the fascicles uniflorous, rarely 2- or 3-flowered cymose; pedicels 1-2 cm. long, puberulous and ciliate; corolla choripetalous, the petals oblong, 3 mm. long; staminodes one-third the length of the petals, the sterile anthers sagittate; ovary globose-ovoid, 2 mm. in diameter, the style 1 mm. long, the stigma columnar, pubescent. Fruit globose, 6 mm. in diameter, the persistent calyx subexplanate, 5 mm. across, the lobes rounded, ciliate, the style evident, 1 mm. long, the stigma columnar-mammiform. Pyrenes 4-6, elliptic in outline, the ends pointed, 4-5 mm. long, 2 mm. wide, longitudinally 3- or 4-ridged but esulcate on the dorsal surface, smooth or with a single ridge on the side, the ridge removable, the endocarp coriaceous.

CHINA: Kwangtung: Fang-ch'eng (Na-leung), *W. T. Tsang* 26501 (A); Kung-p'ing-shan, *W. T. Tsang* 26678 (A). Kwangsi: south of Nan-ning, Seh-fong-dar-shan, *R. C. Ching* 8338 (NY, ISOTYPE); Shang-tze, Shap-man-tai-shan, *W. T. Tsang* 21956 (A), 22035 (A); *H. Y. Liang* 69644 (A).

INDO-CHINA: Tonkin: Pac-si, *W. T. Tsang* 26907 (A); Hanoi, *W. T. Tsang* 29045 (A); Dam-ha, *W. T. Tsang* 29930 (A).

Ilex salicina is endemic to the tropical forests along the Kwangtung-Kwangsi-Indo-China border. It is a common shrub in thickets or in swampy places. The fragrant white flowers appear in April. The mature fruit is red.

In its low shrubby habit, its fasciculate inflorescences, its long-pedunculate individual branches of the staminate flowers, its styliferous ovary, its columnar and pubescent stigmata, and striate-esulcate coriaceous endocarp, *Ilex salicina* reveals its very close relationship with *Ilex metabaptista* Loes. The latter differs only in being pilose all over and in having epunctate leaves. *Ilex salicina* is perhaps no more than varietally distinct.

The descriptions of the staminate and pistillate flowers are drawn respectively from *Tsang* 22035 and 29045.

95. *Ilex dolichopoda* Merr. & Chun in Sunyats. 5: 107. 1940.

An evergreen tree up to 7 m. high, with stout minutely puberulent branchlets, large (20 cm. long) entire leaves, fasciculate infructescences, very long (2.5-3 cm.) pedicels, globose fruits with mammiform stigma, and 5 or 6 striate pyrenes.

Branchlets cinereous; third year's growth 6 mm. in diameter, longitudinally minutely rimulose, the lenticels minute, inconspicuous, the leaf-scars oblong, suborbicular, 4.5 mm. in diameter, slightly elevated; second

year's growth 5 mm. in diameter; current year's growth 4–5 mm. in diameter, subterete; the terminal buds pulvinate, minutely puberulent. Leaves occurring also on second year's growth, 15–25 mm. apart; stipules callose, broadly and shortly deltoid, acute; petioles terete, stout, 4 mm. in diameter, 8–10 mm. long, about one-twentieth the length of the lamina, very narrowly canaliculate above, otherwise rugose; lamina coriaceous, griseous-olivaceous, slightly shiny above, opaque beneath; oblong or obovate-oblong, the lower half almost cuneate, 18–25 cm. long, 6–7 cm. wide; base rounded; apex deltoid-acute; margin entire, when dry slightly recurved; midrib narrowly impressed, glabrous above, thickly elevated beneath, the lateral nerves 12–15 on each side, obscure above, prominent and elevated beneath, the reticulation of the veinlets obscure above, prominent beneath. Infructescences fasciculate, axillary on second year's growth, the fascicles 9–16-flowered, the individual branches unflowered, the bracts broadly deltoid, acute; pedicels 28–32 mm. long, puberulent; prophylla 1 or 2, unevenly inserted, 4–8 mm. above the base of the pedicel; persistent calyx explanate, puberulent, 7 mm. in diameter, broadly 6-lobed, the lobes semiorbicular or reniform, 1.5 mm. long, 3 mm. wide at the base, very minutely ciliate or eciliate. Fruit (young) subglobose, 8 mm. in diameter, when dry smooth, shiny, brown, punctate with yellow spots, the stigma columnar-mammiform. Pyrenes 5 or 6, elliptic in outline, 5 mm. long, 1–2 mm. wide, 3-striate on the dorsal surface, reticulately striate on the side, the mature endocarp not seen.

CHINA: Hainan: Po-ting, *F. C. How* 27955 (A, TYPE).

Ilex dolichopoda appears to be endemic to Hainan Island. It grows as a tree in forested ravines at an altitude of 600 m. Its flowers probably appear in May, since its fruits are still very young in middle June.

The fasciculate infructescences, the long fruiting pedicels, and the prominent stigma on the fruit of *Ilex dolichopoda*, all point to a very close relationship with *Ilex cochinchinensis* (Lour.) Loes. The latter has only proportionally longer petioles (about one-eighth as long as the lamina) and smaller leaves. The two may not be distinct.

96. *Ilex kobuskiana*, sp. nov.

Frutex vel arbor parva, glaberrima; foliis coriaceis, integerrimis, subtus punctatis, oblongis, raro ellipticis, 4.5–9 cm. longis, 1.5–4 cm. latis, basi rotundatis vel obtusis, raro cuneatis; apice breviter acuminatis, acuminebus 5–7 mm. longis, retusis vel obtusis, costa supra plana, subtus elevata, nervis lateralibus supra obscuris, subtus prominentibus; inflorescentiis fasciculatis, ♂ 3-floris, pedunculis 1.5–3 mm. longis, pedicellis 2 mm. longis, ♀ 1-floris, pedicellis 5–8 mm. longis; floribus 5–8-meris; calycibus 3.5–4 mm. diametro, 6-lobis, ciliatis; corolla rotata; staminibus cum petalis aequilongis; fructibus globoso-ovoideis, 4 mm. diametro, stigmate umbilicato; pyrenis 6, 4 mm. longis, striatis, esulcatis, endocarpio coriaceo.

An evergreen shrub or small tree up to 20 m. high with glabrous branchlets, large ovate or oblong-elliptic entire punctate leaves, abruptly

and shortly acuminate apices, fasciculate inflorescences, puberulent short pedicels, 6–8-merous flowers, retuse staminodes, globose drupes with large navel-like stigmas, and 6 striate-esulcate pyrenes.

Branchlets subterete, glabrous, castaneous when dry; third year's growth 4 mm. in diameter, longitudinally rimulose, rugose with numerous conspicuous lenticels, the leaf-scars very narrowly crescent-shaped, plane; second year's growth 3 mm. in diameter, the lenticels numerous and conspicuous; current year's growth angular, 2.5 mm. in diameter, glabrous, the terminal buds broadly oval, puberulous, unfolding after anthesis. Leaves occurring also on second year's growth, 5–20 mm. apart; stipules callose, deltoid, acute; petioles 9–12 mm. long, about one-eighth the length of the lamina, glabrous, deeply canaliculate above, rugose beneath; lamina thickly coriaceous, brunneous, shiny above, opaque and punctate beneath, broad-elliptic or oblong, 4.5–9 cm. long, 1.5–4 cm. wide; base rounded or obtuse, very rarely cuneate; apex abruptly and shortly acuminate, the acumen 5–7 mm. long, the point obtuse or retuse; margin entire; midrib plane or slightly elevated above, prominent and elevated beneath, the lateral nerves 9 or 10 on each side, obscure above, prominent beneath, anastomosing near the margin, the reticulations of the veinlets evident beneath. Inflorescences fasciculate, axillary, on second year's growth, with abortive terminal buds, the bracts callose, tricuspidate, minutely puberulous. Staminate inflorescences: individual branches of the fascicles 3-flowered, cymose; peduncles 1.5–3 mm. long, the pedicels 2 mm. long, glabrescent, with 2 basal prophylla; pistillate fascicles uniflorous, the pedicels 5–8 mm. long, puberulous, the prophylla 2, submedian; flowers 5- or 6-merous; calyx patelliform, 3.5 mm. across, rugose, shallowly 6-lobed, the lobes rounded, ciliate; corolla rotate, 6–7 mm. across, the petals obovate-oblong, 3 mm. long, one-fifth connate at the base; stamens equaling the petals in length, the anthers oblong; rudimentary ovary pulvinate, the apex obtuse. Pistillate inflorescences: individual branches of the fascicles uniflorous; pedicels 5–8 mm. long, puberulous, with 2 submedian prophylla; flowers 5–8-merous, calyx 4 mm. across, 6-lobed, the lobes rounded, ciliate; corolla rotate, 7 mm. across, the petals 6–8, ovate-oblong, 3 mm. long, one-fifth connate at the base; the staminodes three-fourths the length of the petals, the sterile anthers sagittate, with a retuse apex; ovary broadly ovoid, the apex obtuse with navel-like stigma. Fruit globose-ovoid, 4 mm. in diameter, the persistent calyx 4 mm. across, orbicular in outline, the lobes ciliate. Pyrenes 6, elliptic in outline, the ends pointed, 4 mm. long, 1.8–2 mm. wide, longitudinally striate and esulcate, the endocarp coriaceous.

CHINA: Kwangtung: Ta-pu, *W. T. Tsang* 21145 (TYPE for pistillate flower and fruits, A; K, LU, NY). Hainan: Bak-sa, *S. K. Lau* 26603 (A), 26619 (A); Lok-tung, *S. K. Lau* 27250 (A), 27258 (A).

INDO-CHINA: *A. Chevalier* 41250 (NY).

Ilex kobuskiana is a native of eastern Kwangtung and Hainan. It forms a shrub or small tree in woods or thickets and flowers in May. The fruit has been reported to be red.

The coriaceous entire leaves, the fasciculate inflorescences, and the striate esulcate pyrenes of *Ilex kobuskiana* suggest a close relationship with *Ilex wilsonii* Loes. The latter differs in having epunctate smaller leaves, 4-merous flowers, glabrous pedicels, and thickly discoid stigma. The punctate entire leaves of *Ilex kobuskiana* are similar to those of *Ilex cochinchinensis* (Lour.) Loes. The latter species, however, has the fruiting pedicels exceeding the pedicels and the stigma is columnar.

The staminate flower has been described from *Lau* 26619.

This species is named in honor of Dr. C. E. Kobuski, Curator of the Herbarium of the Arnold Arboretum, Harvard University.

97. *Ilex retusifolia*, sp. nov.

Frutex pubescens; foliis coriaceis, ellipticis, 5–7 cm. longis, 2–3 cm. latis, subtus punctatis, basi obtusis, apice breviter acuminatis et retusis, integerrimis; costa supra et subtus elevata pubescenteque; nervis lateralibus utrinque 7–9 obscuris; inflorescentiis fasciculatis, unifloris; pedicellis 4–5 mm. longis, puberulentibus; floribus 4- vel raro 5-meris; calycibus 2.5 mm. diametro, puberulentibus, ciliatis; corolla 5 mm. diametro, chori-petala; petalis ovatis, 2.5 mm. longis, eciliatis; staminodiis quam petalis $\frac{1}{2}$ brevioribus; ovario ovoideo-globoso, 1 mm. diametro, stigmate discoideo.

An evergreen shrub with puberulent branchlets, petioles, and midribs, broad elliptic entire leaves, retuse apices, fasciculate inflorescences, and glabrous staminodes.

Branchlets terete, castaneous when dry, puberulent; third year's growth 3 mm. in diameter, the older portion with small elliptic lenticels; second year's growth 2 mm. in diameter, longitudinally plicate, rugose, the lenticels lacking; current year's growth 1.5 mm. in diameter, longitudinally ridged and sulcate, the terminal buds ovoid-conic, puberulent. Leaves occurring even on the fourth year's growth, 5–15 mm. apart; stipules deltoid, acute, persistent; petioles 8–12 mm. long, one-seventh to one-fourth as long as the lamina, puberulent, broadly and shallowly canaliculate above; lamina coriaceous, olivaceous-brunneous, opaque on both surfaces, punctate beneath, broad-elliptic, 5–7 cm. long, 2–3 cm. wide; base obtuse; apex very shortly produced and retuse; margin entire; midrib elevated and pubescent on both surfaces, the lateral nerves in 7–9 pairs, obscure on both surfaces, the reticulation of the veinlets obsolete. Pistillate inflorescences fasciculate, axillary on second year's growth, the individual branches uniflorous, the bracts broadly deltoid, tricuspidate, puberulent; pedicels 4–5 mm. long, puberulent, with 2 deltoid puberulent sub-basal prophylla; flowers 4- or rarely 5-merous; calyx patelliform, 2.5 mm. across, puberulent, deeply 4-lobed, the lobes obtuse, retuse, or rounded, ciliate; corolla rotate, 5 mm. across, choripetalous, the petals ovate, 2.5 mm. long, eciliate; staminode one-half the length of the petals, the sterile anthers ovate-cordate, glabrous; ovary ovoid-subglobose, 1 mm. in diameter, the style evident, very short, the stigma discoid, convex. Staminate flowers and fruits not seen.

CHINA: Kwangsi: Shing-an-hsien, T. S. Tsoong (= Z. S. Chung) 81819 (TYPE, A).

Ilex retusifolia is a shrub endemic to the tropical forests of southwestern Kwangsi. Its yellowish flowers appear in June.

The broadly elliptic leaves, the elevated midrib, and the 4-merous flowers of *Ilex retusifolia* closely relate this species to *Ilex wilsonii* Loes., but the latter has epunctate glabrous leaves with caudate apices.

98. *Ilex cochinchinensis* (Lour.) Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 230 (Monog. Aquif. 1: 230). 1901; Pitard in Lecomte, Fl. Gén. Indo-Chine 1: 853. 1912; Merr. in Trans. Amer. Phil. Soc. New Ser. 24(2): 245 (Lour. Fl. Cochinch. 245). 1935.

Hexadica cochinchinensis Lour. Fl. Cochinch. 562. 1790; 687. 1793.

Ilex ardisioides Loes. op. cit. 359. 1901; Hayata in Jour. Coll. Sci. Tokyo 30: 53. 1911; Yamamoto, Suppl. Ic. Pl. Form. 1: 30, fig. 10. 1925; Kanehira, Form. Trees 369. 1936; Hu & Tang in Bull. Fan. Mem. Inst. Biol. Bot. Ser. 9: 254. 1940. *Syn. nov.*

Ilex cleyeroides Hayata, Ic. Pl. Form. 3: 53. 1913. *Syn. nov.*

Ilex oligadenia Merr. & Chun in Sunyats. 5: 108, pl. 14. 1940. *Syn. nov.*

An evergreen tree up to 9 m. high with large elliptic or oblong-elliptic entire punctate leaves, fasciculate inflorescences, globose fruits, columnar-mammiform stigma and 4 or 5 pyrenes.

Branchlets subterete, brunneous or castaneous, longitudinally plicate-rugose; third year's growth 4 mm. in diameter, the lenticels minute, the leaf-scars suborbicular, slightly elevated; second year's growth 2.5–3 mm. in diameter, the lenticels minute, inconspicuous; current year's growth angular, minutely and sparsely puberulent below the terminal bud and in the grooves, otherwise glabrous, the lenticels often evident, the terminal buds subglobose, very minutely puberulous. Leaves occurring also on second year's growth, 3–5 mm. apart; the stipules broadly deltoid, callose, often obscure; petioles 7–10 mm. long, one-sixteenth to one-twelfth as long as the lamina, glabrous, shallowly and broadly canaliculate above, transversely plicate-rugose beneath; lamina thin-coriaceous, olivaceous or brunneous-olivaceous, opaque on both surfaces, punctate beneath, elliptic or oblong-elliptic, 9–16 cm. long, 2.5–4.5 cm. wide; base obtuse or cuneate; apex acuminate, the acumen 3–10 mm. long, the very tip acute or obtuse; margin entire; midrib narrowly impressed above, prominently elevated beneath, both glabrous, the lateral nerves in ca. 8 pairs, obscure above, prominent underneath, reticulate near the margin, the reticulation of the veinlets evident only beneath. Inflorescences fasciculate, axillary on second year's growth; flowers 4- or rarely the calyx 5-merous. Staminate inflorescences: individual branches of the fascicles 3-flowered, the bracts very shortly and broadly deltoid, acute, thick-coriaceous; peduncles 4–6 mm. long, the pedicels 1–2 mm. long, glabrescent or minutely puberulent; calyx patelliform, glabrescent, deeply 4-, rarely 5-lobed, the lobes rounded, ciliate; corolla rotate, the petals ovate, eciliate, one-fourth connate at the base; stamens shorter than the petals, the anthers oblong-ovoid, 0.8 mm.

long; rudimentary ovary pulvinate, shortly rostellate. Pistillate flowers not seen. Infructescences: individual branches of the fascicles uniflorous; pedicels 8–9(–15) mm. long, puberulous, with 0–2 basal prophylla. Fruits globose, 5–6 mm. in diameter, the persistent calyx subcyathiform, 5 mm. across, pubescent, shallowly 4-lobed, the lobes rounded, ciliate, the stigma columnar-mammiform, with thick exocarp. Pyrenes 4 or 5, oblong-trigonus in outline, 6 mm. long, 2.5 mm. wide on the back, smooth, the endocarp coriaceous.

CHINA: Taiwan: South Cape, *A. Henry 1311* (ISOTYPE of *Ilex ardisioides*, A). Hainan: Po-ting, *F. C. How 72496* (TYPE of *Ilex oligadenia*, A); Kan-en, *S. K. Lau 5406* (A); without precise locality, *H. Y. Liang 64712* (A, NY).

INDO-CHINA: Tonkin: *Bon 3366* (fragment, A); *Loureiro* (photo of TYPE of *Hexadica cochinchinensis*, A); Sai-wang-mo-shan, *W. T. Tsang 30421* (A).

Ilex cochinchinensis was first described as *Hexadica cochinchinensis* by Loureiro (1790) from his own material collected in Indo-China. A comparison of a photograph of this type with the Taiwan and Hainan material shows them to be conspecific. In China it grows as a tree in the tropical and subtropical forests. The flowers may appear in late February and last until April.

The fruits of Loureiro's specimen are too young for a study of the pyrenes. These structures were first described when Loesener gave his account of the synonymous *Ilex ardisioides*. Concerning the pyrenes he wrote, "dorso convexo medio longitudinaliter 1-striate a costa media striis minoribus paucis utrinque ascendentibus, ceterum esulcatis." This needs correction. The reticulate vascular bundles on the pyrene of *A. Henry 1311* fall off so readily that the pyrenes appear to be naturally smooth.

In its punctate lower leaf-surfaces, its fasciculate inflorescences, and its prominent stigmata, *Ilex cochinchinensis* is closely related to *Ilex salicina* Hand.-Mzt., but differs in its broader leaves. In its long-pedicellate fruit, prominent stigma, and prominent venation of the leaves, *Ilex cochinchinensis* also resembles *Ilex dolichopoda* Merr. & Chun, but the latter has extraordinarily large leaves (18–25 cm. long, 6–7 cm. wide) with a rounded base, and very long fruiting pedicels (3 cm. long). It is also a very poorly known species. Until more collections become available for study, it seems best to accept it as distinct, at least provisionally.

Ilex cochinchinensis was once erroneously recorded from Hainan. That report was based on *W. T. Tsang 697* (LU 17446), which turned out to be an *Ehretia*.

(To be concluded)

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